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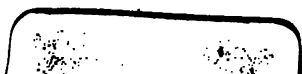
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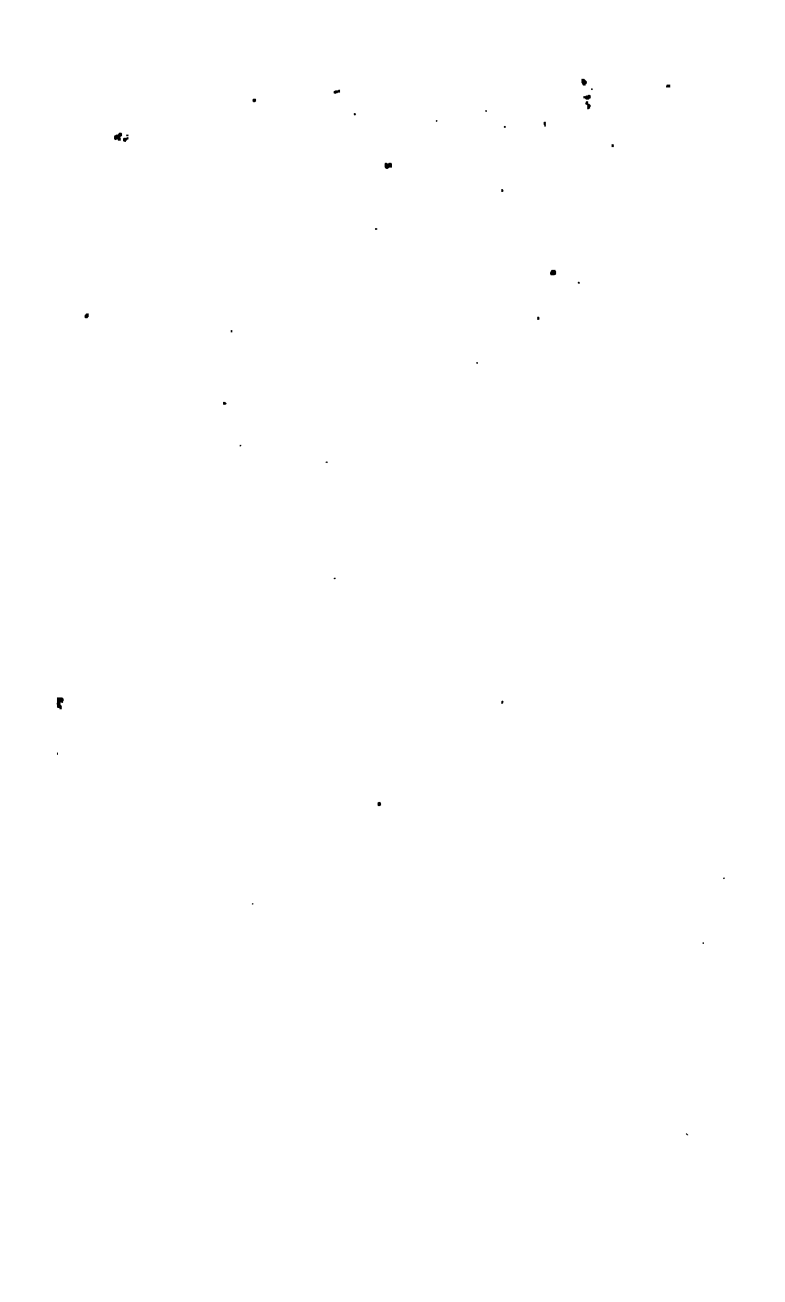


Miss J. B. Heber
April 13th 1831

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BERTHA'S
VISIT TO HER UNCLE
IN
ENGLAND.

IN THREE VOLUMES.

VOL. III.

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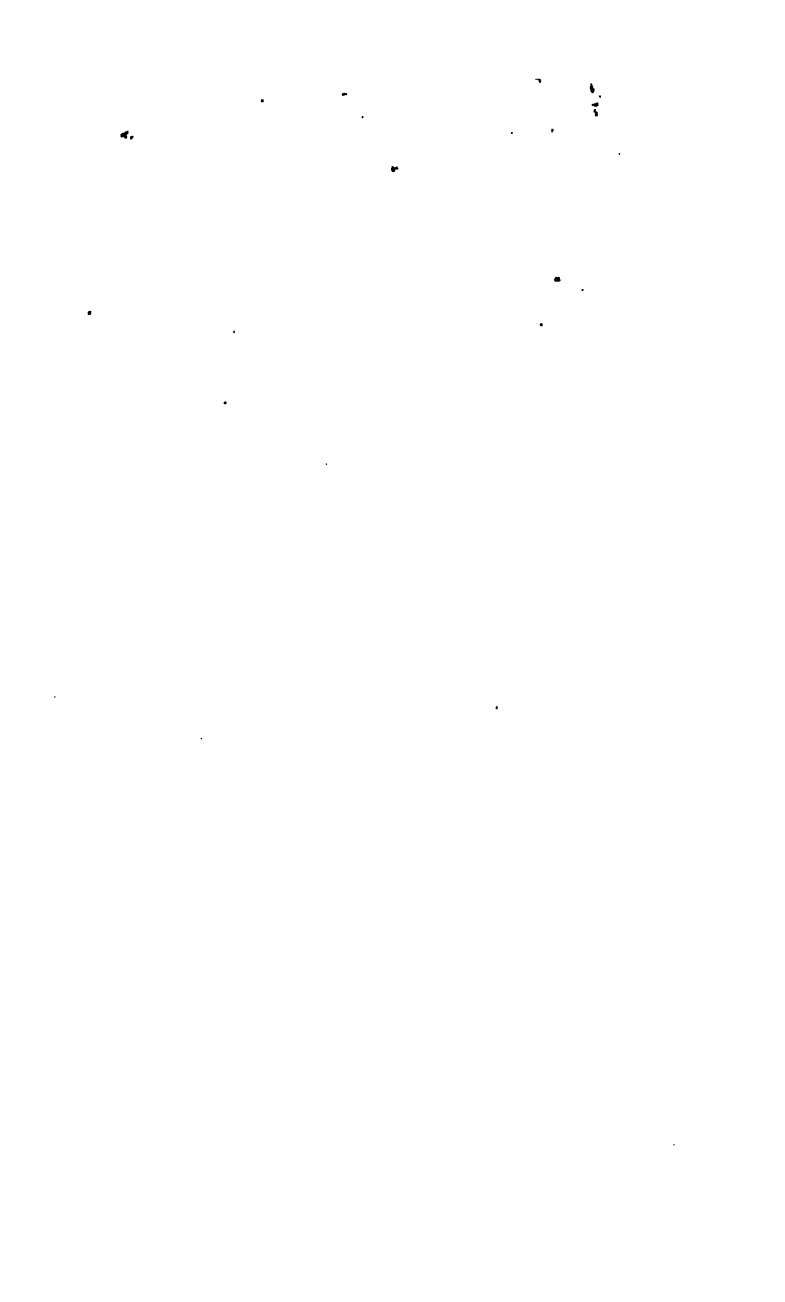
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BERTHA'S VISIT.

19th, *Sunday*.—My dear aunt is certainly much better.—By her desire I was permitted to take care of her while the rest of the family went to church ; and I was thus left sole guardian of this good patient, so precious to us all.

Immediately after they went away, she fell into a gentle slumber, and, as I had not provided myself with a book, and was fearful of disturbing her by walking to the book-case, I sat quietly near the bed, so that I could watch her. For want of other employment, I amused myself with comparing my former with my present life ; and, though on the whole they are very different, there is one point, dear Mamma, in which they are perfectly similar—for the friends I am now with are, just like you, really and rationally religious. My reverie over, I repeated to myself some of our favourite sacred poetry, among which was Mrs. Barbauld's address to the Deity. I then tried to recollect the various religious books I had read since

I came here; and afterwards I endeavoured to arrange the knowledge which I had acquired, not only from them, but from my uncle's conversations.

While I was engaged in these reflections, my aunt awoke, and, having taken her medicine, she desired me to read to her some of the Old and New Testament; and then, as she insisted on it, I went out for a short time, leaving her maid in the room.

My mind, of course, dwelt on that good and amiable aunt, to whom I owe so much; and every turn I made in the garden brought me to some object that reminded me of the kind things she had said to me in our walks, and the many opportunities she had taken of giving my mind a right direction. Her religion is always cheerful, and she has the art of introducing little useful reflections into common conversation, so as to double the impression they make. Just where I was then sauntering, she had said to me, only a few hours before she was taken ill, 'You see that the embryo plant contained in this seed will not vegetate without heat and moisture—and so, my dear niece, our good dispositions, whatever they may be, will wither away without the continual help of Him who is ever ready to assist us, and to open our minds to the high views of a future state, which He has set before us; nor, Bertha, can it be

considered one whit more wonderful that we should hereafter change into a life of immortality, than that the larva should burst into a beautiful butterfly, or that these little black seeds should expand into luxuriant foliage, and deck their branches with splendid flowers.'

The wind had been very high all that morning, and many broken branches were scattered about the shrubbery: my aunt seemed to delight in the 'wild music of the wind-swept grove;' and, as we sheltered ourselves from the blast, she pointed out to me the numbers of minute insects that were enjoying their short day of existence, unmindful of its terrors; and the birds that were struggling through it with materials for their nests; and the bees, who could scarcely withstand its power, yet were urged on, by their instinctive industry, to begin their winter's store. 'How that hoarse storm,' she exclaimed, 'and all these tokens of the opening spring, remind one of the Almighty power and benevolence!'

I quoted the well-known line—

Which Nature's works through all their parts proclaim.

'Well applied, Bertha. In every department of nature we find sufficient proofs of that omnipotence and goodness. The astonishing force of an unseen agent, like the wind, comes home indeed to the feelings at this moment, and leads one to reflect on its wonderful causes and its beneficial effects; but when we view, with the

astronomer, the countless stars, and the regular movement of the planets in their orbits ; or, with the chemist, trace the infinite variety of matter up to the different proportions in which a few elementary substances are combined ; or if we examine the microscopic perfection of the commonest of these flowers ; or the young leaves already formed, and wrapped up for months in the buds ; or the beautiful preparation of hard scales and downy net-work, for the preservation of the young plant inclosed in the seeds,—the mind is absolutely lost in admiration.

I read His awful name emblazon'd high,
With golden letters, on the illumined sky :
Nor less the mystic characters I see,
Wrought in each flower, inscribed on every tree.
In every leaf that trembles in the breeze,
I hear the voice of God among the trees.'

20th.—For some days past, the rooks have been very busy, building their nests. There are a few tall trees near this, which stand in a clump apart from the rest: Frederick says that the rooks have a fancy for them, and build there year after year. No creatures seem to be more attached to the place where they have lived ; nor can any be more sociable, as they generally place several nests together. But their sociable disposition does not imply honesty towards each other ; for, when a pair are constructing their nest, one always remains to guard it, while the other goes in search of materials, lest it might be pillaged

by the neighbouring rooks. Frederick and I observed a transaction of this nature to-day; and it caused a great uproar, for the crime is always punished by expelling the thieves from the society.

White, of Selborne, says, they depart on foraging excursions in the morning, and return in the evening; and that, after the young have taken wing, there is a general desertion of the nest-trees; but he says the families return in October, to repair their dwellings.

Among their favourite food is the grub of the chaffer-beetle, which, if allowed to multiply, would lay waste the corn-fields and meadows;—and yet, how many mistaken people accuse these poor rooks of doing mischief!

Frederick contrived to get one of them to show me, that I might know how to distinguish them from other species of the crow family. The rook is black, tail somewhat rounded, plumage glossy; the bill is more straight and slender, and its base is encircled by a naked white skin, which is scaly, and takes the place of those black, projecting feathers or bristles, which, in the other species of crow, extend as far as the opening of the nostrils.

Rooks, I am told, are birds of passage in France, but in England they are stationary. In Siberia, they are the forerunners of summer; and in France, they announce the approach of winter.

Now that they are busy building their nests,

they make a noisy, hoarse cawing, which I have not yet persuaded myself to like ; but it is agreeable to Mary and Caroline—I suppose, because it is united in their minds with the idea of spring.

21st.—After sitting a little time with my aunt, who, I am delighted to tell you, is much better, I had a botanising walk with Miss Perceval. What a very agreeable companion she is !

She told me that few countries, so limited in extent, comprise such a variety of plants as the British islands. Yet few of them are peculiar to these countries : those of our southern districts may be almost all found in France and Germany ; those of Scotland are nearly common with the productions of Sweden and Denmark ; and our elevated hills supply a vegetation similar to that of Norway and Lapland. The climate of Ireland varies so little from that of the corresponding parts of England and Scotland, that there is scarcely any difference in their native plants. She mentioned, however, two ; the *menziesia polifolia*, or St. Patrick's heath, and the *saxifraga geum*, with its varieties, which are found wild in Ireland only. I reminded her of the arbutus, but she seemed to doubt that it is a native of Killarney, which surprised me, as you told me that it was ; and my uncle expressed the same opinion lately. On the contrary, she is inclined to believe the tradition, that the Monks

of Mucross Abbey introduced it there from Spain—for, she says, trees are seldom found, in a state of nature, confined to one spot only: and it is well known that the *arbutus* does not grow naturally in any other part of Ireland; it grows, however, abundantly, on all the shores of Spain, and from thence she thinks it may have been originally brought.

She gave me a very satisfactory reason why the native vegetable productions of Great Britain are inferior in number to those of countries on the continent; few seeds are furnished with the means of flying across the Channel, so as to have naturalised themselves here. Where no sea intervenes, they are gradually but continually spreading from one place to another. On the road-sides, and in the corn-fields of France, Germany, and Holland, we see many plants which have been imported for our gardens; even in the *Flora Danica*, there are many belonging to that small country, which are not possessed by us; and all the mountainous regions of Europe, though separated by a great distance, have several species in common, while we can boast of very few which are found in Great Britain only.

Miss P. told me, however, of some; for instance, the Isle of Man cabbage has not yet been observed in any other parts of the world than in that island, in the Hebrides, and on the north-

western shores of England and Scotland. One of the most interesting of our British plants, she says, is pipewort; for, in no part of the continent of Europe is it, or any individual of this genus, to be found; and, what is very remarkable, though all the other species of the family are inhabitants of the tropics, yet ours is found in one of the most northern of the Hebrides, and in a lake which is peculiarly cold.

It is the same among the *cryptogamous* tribes, such as lichens, fungi, and mosses. Though we think Britain rich in that extensive class, most of them are known in other parts of Europe, or in North America; and she says it is a singular fact, that the lower we descend in the scale of vegetation, the more universally are the individuals of those tribes dispersed over the surface of the globe. In Carolina, for example, a large proportion of the *fungi* are the same with those of France and Germany, while, among what she calls the *phenogamous* plants, or those which have *visible flowers*, there are scarcely any that are common to Europe.

The *mosses*, too, which have been received from the higher parts of North America, and from Kamtschatka, are almost all indigenous in Europe.

22nd.—I had often wished to see the contents of a set of nice little drawers under the book-

cases, on one side of the library ; at last, to my great satisfaction, I have been allowed to examine the small geological collection which they contain. It consists of specimens of the different *series* of rocks, accompanied by the organic remains which distinguish them.

My uncle first showed us some bits of hornblende, primary limestone, mica-slate, and granite, as specimens of the inferior order, or ancient primitive rocks, destitute of all organic remains, and having something of a crystalline appearance.

Next he showed us the drawers containing the transition or submedial series, including greywacke, transition limestone, quartz, common slate, and serpentine ; they contain some specimens of the lowest scale of organized beings, such as zoophytes, madrepores, and testacea, but very sparingly, and all different from those now known.

Then came the medial order, or carboniferous rocks of old red sandstone, mountain limestone, and all the parallel strata of coal, slate-clay, and freestone, which he calls *coal measures*. He showed us abundant remains in them of animals, but very few of which have any resemblance to existing species. Some of the limestone or marble specimens were polished on one side, so as to show their beautiful veins and colours. On several bits of the coal and black

slate, I saw the impression of leaves, branches, and seeds, but no shells, or any kind of animal remains; there was one perfect fern leaf, but, my uncle says, of an unknown family, and a great many reeds. There was also a flat block of greyish freestone, on which the regular scales of some seed vessel, like a very large fir-cone, were deeply marked; and on another, I am sure I could distinctly trace the imbricated form and the spines of the common prickly pear of the Brazils. Indeed, my uncle thinks that all these vegetable remains seem nearly allied to the plants of tropical climates; and he says, it would be a most interesting employment for some naturalist to devote himself to the study of what might be called *subterranean botany*. These coal measures occupy several drawers; for, besides the Staffordshire, Newcastle, and other coals, he has specimens of the seventeen coal beds of the forest of Dean, and a large collection of their organic remains, which he has taken great pains in arranging.

The next drawers contain the supermedial series, beginning with the magnesian limestone, new red sandstone, and red marl. There are very large districts of this formation in the central parts of England, and they include the great deposits of rock-salt, which is of so much importance, he says, to the empire. Considerable beds of gypsum are also found; but it

contains no organic remains of either animals or vegetables. Above these,—for you no doubt have perceived, what I forgot to mention, that my uncle began at his lowest drawer, in order to show the lowest strata first—above these, he showed me a collection of the lias and oolite strata, both of them impure limestones, but extremely rich in the number and variety of organic remains. These consist of ferns and flags, corals and zoophytes, shells of all kinds, univalve, bivalve, and multivalve; ammonites of all sizes, fishes of several species, and turtles and other amphibia, unlike any of the species now known. To one of these amphibia has been given the name *ichthyosaurus*, which, my uncle says, means the fish-like lizard; it having the head of a crocodile and the back-bone of a shark: he has only a small specimen, which stands over the book-case; but, he says, some have been found in the lias near Lyme, in Dorsetshire, three or four feet in length. And he told me that at Stonesfield, near Woodstock, in Oxfordshire, the fossil remains of another extraordinary animal of the amphibious tribes was discovered, which has been called the monitor; no complete skeleton of it has yet been put together, but many of the detached parts must have belonged to an animal forty feet long, and twelve feet high!

The remainder of this numerous series con-

sists of different strata of sands and clays, and various limestones, up to the chalk formation; and they contain a repetition of the fossils he showed me in the lower parts of it. He frequently made me observe, that these fossils are all not only very widely distinguished from the families found in the carboniferous and transition series, but that there are also striking peculiarities in themselves, according to the bed which they occupy.

We came next to the great chalk formation, with its wonderful deposition of flints in parallel layers; and then to the last, or superior order, consisting of gravel or sand, or of clay, which is, in some places, four or five hundred feet thick, and resting on the chalk. Its organic remains are highly interesting; but my uncle said he would not perplex our memories at present, by a minute examination of the specimens in his collection; he wished to give us general ideas, hereafter we may study the particulars. Before he closed his drawers, he showed us, that below this upper formation all the remains of organic bodies were in a petrified or mineralized state; that is, the general structure and external form of the body has been preserved, but the original matter of which it was composed has entirely disappeared, and has been replaced by the substance of the mineral in which it was imbedded. On the contrary, in the strata which cover the

chalk, the shells are merely preserved, and in such a state, that when the clay or sand in which they lie is washed off, they might appear quite recent, if they had not lost their colour and become more brittle. My uncle showed us a few specimens of these, and also of some shells, which, he says, are peculiar to *fresh* water, but which are often found in alternate layers with the *marine* shells, as if they had been deposited by alternate inundations of fresh and salt water. And lastly, he showed us some of the shells found in a horizontal stratum of gravel on the coasts of Essex and Suffolk, about fifty feet above the sea, which are exactly the same with the shells at present existing in the sea on the same coast. Above all these regular strata, he says, there is in many places spread a confused covering of gravel, apparently formed by the action of a deluge, which had shattered and rounded the fragments of the rocks over which its torrents had swept.

In this gravel the remains of numerous land quadrupeds are found ; many of them of species now unknown, such as the mastodon, and mammoth or fossil elephant, with varieties of the hyæna, bear, rhinoceros, and elk, but indiscriminately mingled with others, which still exist in the country.

I have taken a good deal of pains to acquire a clear idea of this order of the strata, with their

vegetable and animal remains. My uncle did not shew them all at one time; we went over them by degrees, a little every day; but I have just summed them up altogether, to give you an idea of what I have seen.

24th, Good Friday.—Before we went to church to-day, my uncle spoke to us for a short time on the solemn event we were going to commemorate; and though my notes of what he said can be of little use to you, yet I am anxious to shew my dear Mamma that I take still more pains to profit by what he tells us on this most important subject, than upon geology or any thing else.

‘You are too well acquainted with Scripture,’ said he, ‘not to know that the lesson which it everywhere inculcates is, that man by sin and disobedience had fallen under the displeasure of his Maker, and that there was an invincible necessity, however inexplicable to our comprehension, that our Saviour should lay down his life to redeem us from that sin, and to procure for repentant sinners forgiveness and acceptance.’

‘That the death of Christ was the real and efficient sacrifice, of which the various offerings under the law were but the types or shadows, is evident from a crowd of passages in Holy Writ, to which I have repeatedly drawn your attention. But, as if to prevent the possibility of doubt on

the subject, St. Paul emphatically tells the Hebrews, that the High Priest entering into the Holy of Holies with the annual sin-offering was only "a figure for the time then present." And he distinctly adds, that Christ, not "by the blood of goats and calves, but by his own blood, obtained eternal redemption for us."

' The promise made to our first parents intimated a future deliverer, who should remove those evils which had been entailed on mankind by their misconduct. This was the assurance that became to the Israelites the grand object of their faith; and it was to perpetuate this fundamental article of their hope and belief, that a standing memorial both of the fall and of the promised deliverance was appointed. Now, what memorial could be more apposite than that of *animal sacrifice*?—It connected in one view the two great events in the moral history of man,—the Fall, and the Recovery; the death denounced against sin, and the death appointed for that Holy Intercessor, whose blood was to be accepted as a final atonement.

' How true it is, that the ways and thoughts of God are not like those of men!

' Wonderful in every part of it, but chiefly in the last acts of it, was the awful scene of this stupendous expiation. That the author of life should himself be made subject to death—that his sufferings and humiliation should be the

manifestation of his glory—that by stooping to death he should conquer death;—and that the height of human malice should but accomplish the purposes of God's mercy !

‘ If you compare the whole chain of prophecies with the history of our Lord's sufferings, you will find that it was not until they were fulfilled to the minutest point, that the patient Son of God, as if then at liberty to depart, said, “ It is finished.”—Yes, all that the wicked were destined to contribute to the general deliverance was finished.

‘ We cannot understand the mysteries of God; but we may easily perceive his goodness. We cannot discover his motives; but we have no difficulty in discovering his will. We cannot comprehend the actions of Providence, or the moral government of the universe; but we can have no uncertainty about the laws which should govern our own actions—they are clearly and forcibly stated in the Gospel; all that it imports a sinful being to know, to believe, or to do, all that concerns our fall and our redemption, everything that involves the greatest interests of the human race, is there unfolded. We cannot penetrate that inscrutable decree which rendered it unfit to pardon sin without vicarious atonement; but we may form some faint conception of th immense sacrifice that Christ made for us, in order to satisfy Eternal

Justice. From the horror with which he contemplated his approaching death, and from the agony with which he prayed that the cup of bitterness might pass from him, we may surely infer that his sufferings were of no ordinary nature—that the sacrifice was, indeed, great. Yet, in the depth of his anguish, his prayer was one of perfect resignation and devout humility —“ Nevertheless, not as I will, but as thou wilt.”

‘ Let us then learn, from his great example, how and where to seek for consolation when misfortune or misery overtakes us ; let us pour forth our petitions with the same fervour as he did ; and let us bow with the same submission in our hearts to the decrees of unerring wisdom.’

25th.—My excellent aunt came down stairs yesterday evening, and this bright cheering day she took a little walk with my uncle. Grace and I had the pleasure of accompanying them. Everything seemed to sympathise with her recovery—all nature seemed to be reviving—buds opening, and young leaves bursting out ; many branches of hawthorn, in sheltered places, quite green, and the young elms feathered with their pretty opening leaves. The glades in the forest were carpeted with primroses—the birds were building in every bush, and singing as they

worked ; the lambs were sporting about, and the pastures beginning to show the little cheerful daisy—

The lambkin crops its crimson gem,
The wild bee murmurs on its breast,
The blue fly bends its pensile stem
Light o'er the skylark's nest.

Grace repeated that pretty stanza of Montgomery's ; and when I asked her if she knew what was meant by ' its crimson gem,' she replied, ' Yes, Mamma told me that the buds of trees are called gems, from the Latin word *gemma*.' My uncle added, that here the term is poetically applied to the flowers while yet unclosed—though it is only leaf-buds to which botanists give that name.

I begged of my uncle to show me the difference between the oats and wheat ; for though there is a great difference in their appearance, when in ear, yet I had not learned to distinguish the young plants.

My uncle pulled up a plant of each, and showed me that the oat shoots upwards, with scarcely more than two leaves, which are much rounder at the end than those of wheat ; but that the plant of wheat produces three or four pointed leaves, which, instead of being directed upwards, are, at first, inclined to spread. After my aunt had returned home, we walked into

some of Farmer Moreland's fields. He is very busy sowing late oats, and planting potatoes in drills, which are made with as much regularity, and the seeds dropped in as equally, as if the distances had been measured by compasses.

The bees have been about for some days,—a sure mark, my aunt says, of the arrival of spring. They began to venture out of their hives about the middle of this month; and their coming abroad is a sign that the flowers from which they gather honey are already opening.

The gooseberry-trees are growing green, and I can distinguish the flower-buds enlarging daily; so are those of the currant, which, in autumn, I saw closely folded up in little scaly buds. The larch-trees are showing their gay green tinge, the spurge-laurel is in bloom; and every tree, and plant, and bird, are rapidly advancing toward the perfection of summer.

I said to my aunt this evening, that I thought the appearance of all nature, wakening as it were from the torpor or death of winter, seemed to be peculiarly suitable to the hopes of that glorious change in ourselves which this period so forcibly brings to our minds. She replied, that it was one of those striking points of connexion between natural and revealed religion which must make a deep impression on every reflecting mind; and she agreed with me, that nothing could afford a better subject for a hymn.

26th, Easter Day.—As soon as breakfast was over, my uncle said he was going to address a few words to us on the great Christian festival which we were about to celebrate.

‘It is most satisfactory,’ said he, ‘to know that whether we consider the number, the means of information, or the veracity of the witnesses, no testimony can surpass that which was borne by the Apostles to the fact of our Lord’s resurrection.’

‘That wonderful event was the accomplishment both of the ancient prophecies, and of his own predictions; it was a miraculous declaration on the part of God, that the great atonement was accepted; it was the Divine attestation to the truth of our Saviour’s doctrines; a full confirmation of the promises he had already held out to his followers, and, consequently, a perfect security to them for the ultimate completion of those further promises which it had been one great object of his mission to offer to mankind. We have reason, therefore, to be thankful that, in the first preaching of the Gospel, Providence ordained that a fact of such importance should be accompanied with irresistible evidence; evidence of such a nature as requires no nice examination to adjust, but such as imparts conviction to every one who can read the Bible.’

‘The Jews were disappointed that Jesus did not show his power by coming down from the

cross ; but he showed his power more fully, by rising from the grave. They saw him taken dead from that cross, and laid in a sepulchre, which was scooped out of the rock, which was accessible only at the entrance, and which was guarded by sixty soldiers. Yet while the soldiers watched, he burst those feeble barriers, and rose from his tomb, to show his followers that those who die in Him shall rise, as he did, to triumph over death.

‘ After his resurrection,’ continued my uncle, ‘ there was a wonderful change in our Lord. Previously to this event, it was in power, and in wisdom, that he had showed himself divine ; but afterwards, everything concerning him seems miraculous and mysterious. This first appears in the manner of his resurrection. He evidently had left the sepulchre before it was opened ; the women who are named by St. Matthew, saw the angel appear and roll away the stone ; but he was already gone. “ To Mary Magdalene,” he said, “ touch me not,” as if there was that divine spirituality about his person which forbade the near approach of human frailty. And twice, when his disciples were assembled and the doors fastened, for fear of the Jews, he appeared in the midst of them ; but to Him who had departed from the unopened sepulchre, it was no difficulty to enter a barricadoed house. From these, and other concurring circumstances, it is

evident that his body had undergone a change, "the corruptible had put on incorruption:" it was no longer the human body in its mortal state—it was the body raised to life and immortality, and united to the Deity.

' There was something about this divinity of his person, that was probably unsuitable to a more open display of himself to the public than he vouchsafed to make. He showed himself, however, to all the Apostles; "he was seen of above five hundred brethren at once;" in short, there were sufficient witnesses to attest his identity, and to publish the truth of his miraculous resurrection to all mankind. The Jewish people, in the rejection of our Lord, had filled the measure of their guilt; they had no further claim on him, and he no longer held his visible residence among them. When led to the cross, he had warned them that they would see him no more till they should be prepared to acknowledge his authority.

' The resurrection of our Saviour ensures resurrection to us also; it insures to us a second life; but the complexion of that life depends on our faith, and our obedience in this. He "will change our vile body, that it may be fashioned like unto his glorious body;" but this transformation of our being requires a previous transformation of our mind.

' It is true that, as nothing has been distinctly

communicated to us on the mode of existence after our resurrection, we can know but little of the precise nature of that future life ; but there may be more analogy in it to our present state than we can now venture to affirm. There is some reason to believe that the employments of the good and wise, and the chief sources of their happiness in this world, have more or less relation to those which they are to enjoy in the world to come. The study of nature, the pursuit of knowledge, and the exercise of our faculties, when controlled by religion and virtue, may all, perhaps, assist in qualifying us for occupations and enjoyments in the " kingdom of the Father," infinitely more excellent and refined indeed, yet not entirely dissimilar.

‘ But whatever view we take of the mode of our future existence, it must revive and invigorate our minds to feel that the evidence of the resurrection of mankind is full and complete ; and that we may, therefore, look forward, with perfect confidence, beyond these clouded scenes of mortality, to their final result. Let us now go, my children, and during the solemn service of this day, let us turn our eyes forward to that permanent happiness that we are taught to expect—and humbled by the discipline and vicissitudes experienced in the present life—now, and always, let us keep our minds steadily and gratefully fixed on that glorious consummation of immor-

tality, which our Lord has purchased for us by his death and resurrection.'

27th.—A new world of knowledge has opened to me, dear Mamma, since my uncle began to teach us a little geology. I know it is but an outline, the slightest sketch, as he says, of the science; but it is sufficient to give a general idea of the strata near the surface of the globe; and the specimens of the different series have made all he told us doubly impressive. He has no beautiful minerals and crystals, as they are very expensive, and not so instructive as his rock collection. Indeed, he considers his children in all that he does; and these drawers were, I believe, arranged purposely for their benefit.

He showed us this morning another class of substances imbedded in the secondary strata; these are the pebbles or broken fragments of rocks which they are often found to contain, and which have evidently belonged to strata older than themselves. For instance, new red sandstone frequently contains pieces of the carboniferous limestone belonging to the order next below it, as well as of many still older rocks: it is, in fact, nothing but a mass of sand and gravel cemented together; and which sand and gravel are only the remains, or *debris* as they are called, of former rocks. My uncle says we may conclude, from this fact, that the rocks from

which those fragments were derived must have been exposed to the action of violently agitated water, which tore off these masses, and rounded them by friction, before the newer rock, in which the fragments are now imbedded, was formed.

—Another conclusion he draws from it, is this : these rocks were undoubtedly, at some former period, beds of loose gravel ; but loose gravel could never have been left by the water piled up in a highly inclined slope : we may therefore be sure, when new sandstone and other rocks of the same kind are found in nearly vertical strata, that this cannot have been their original situation, but that they must have been forced into their present position by some convulsion *after* their consolidation. These consolidated gravel beds are called conglomerates, breccias, or pudding-stones, according to the materials of which they are composed.

He told us that the remains of marine animals, such as we saw the other day, are found in two-thirds of the rocks that compose the surface of the globe ; and even on the highest summit of the Pyrenean mountains in Europe, and of the Andes in America. From this important fact, it is ascertained, without the possibility of doubt, that those continents have not only been covered by the ocean, but that they are formed of materials which once gradually collected at the bottom of that ocean.

A long conversation followed, but I cannot trust myself to write it; it principally turned on the wonderful changes that have taken place in the level of the ocean. What extraordinary causes could have lowered it to its present level, or else have raised up the land out of its bosom?—If the land has really subsided, what can have become of the enormous quantity of water which once flowed round the tops of the loftiest mountains? These questions, he said, have long engaged the attention of philosophers, and many ingenious theories and fanciful suppositions have been advanced to solve them. He slightly mentioned some of them; but merely to gratify our curiosity, strongly advising us to repress our anxiety about causes till we were in possession of facts.

28th. — CANADA EXTRACTS.

‘ *Loghouse, April 5th.*—You can scarcely conceive, when I saw your handwriting, the thrill of delight it gave me—your letter was a real feast—I could not sleep that night, from the fulness of my head and heart.

‘ The snow, I am told, continues later this year than usual; in some places it was three feet deep, and is still deep, though it has gone off rapidly within the last fortnight, as it thaws a little every day, while the sun is hot.

‘ The buds are all swelling, and I have heard one or two new birds of late—but they stay up in the high trees, and I have not been able to see them. We have numbers of dear little tomtits, and some sparrows and crows. I used to despise all these at home, but here I delight in them—they are like old acquaintances. When we first came here, I heard an eagle very often, but he has deserted us.

‘ I am surprised at the nice green herbage that is under the snow ; by which, and the decayed leaves, it has been preserved from the frost. The children bring in plants every day ; the mosses and lichens are all quite new to me.

‘ The deep snow has much delayed the clearing of our land ; next week we are to have five men here to cut down trees—*choppers*, as they are called ; we have one at present, and it is astonishing with what dexterity and speed he fells these huge hemlock pines, nearly one hundred feet high. It is almost sublime to see them stoop their dark heads slowly, and then fall ; very gradually at first, but soon increasing in rapidity—tearing off the neighbouring branches, shaking all the other trees, and coming down with a crash that makes the whole forest echo the sound. The Americans from the United States are employed to *chop*, as they are more expert than people from the old country, and

can make the trees take the precise direction they choose in falling.

' We are much better off than most people are on first settling in the woods. There are some families here, who for the first six months had no food of any kind, except salt pork, for breakfast, dinner, and supper, and without even bread; but we have good bread and peas, and sometimes turnips, with excellent milk. We brought barley and rice with us; and the arrow-root that you gave me is a great comfort to the children;—I never saw three more healthy creatures.

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' *May 2nd.*—Last week we were busily engaged in burning the fallen trees, which covered the surface of the ground that we had cleared.

' The branches were first piled up and burned; then the great stems, which had been cut into pieces about twelve feet long, were drawn together by the oxen, and with much labour raised into piles, and set on fire. This was a very dangerous operation, for some of them were very near our wooden house; and the whole surface of the ground is combustible, as for several inches deep it is composed of leaves and bark, and looks like a bed of peat earth. When this takes fire, the flames rapidly spread, and are very difficult to extinguish; but we are now safe.

‘ The Indians sometimes walk into our house; but they are harmless and inoffensive, and ask only for whiskey, which they like better than anything else. They bring baskets, and little bowls, and dishes made of the bark of the birch-tree, and are glad to sell them for spirits, flour, or pork. They come down the river in their canoes, and can paddle them across the rapids just opposite this house, where no European could venture in a boat.

‘ *June 5th.*—Our first spring flowers were hepaticas, which actually carpeted the ground, as daisies do at home; they were single, but very large, and blue, pink, and white. We had the pretty yellow dog-tooth violets in profusion; then white and crimson lilies; both of them handsome, but with an odious smell: there was another very elegant-looking plant, with a leaf like fumitory, the root a collection of reddish bulbs, and the flower something like a butterfly orchis.

‘ We have now abundance of yellow, white, and purple violets, but the white only have a sweet smell. There is also a beautiful yellow lady’s slipper, and numerous other flowers, which I may describe some other time.

‘ Our shrubs are leatherwood, cranberry, dogwood, Alpine honeysuckle without scent, and

syringa. The trees are elm, maple, oak, beech, cedar, hemlock pine, hiccory, and lime. The oak grows tall and straight; but all the trees grow tall and straight in these forests. I spend what time I can spare in examining the trees and plants that are new to me; I wish my botanical friend Miss Perceval was here to assist me.—We have a great deal of the moss, or rather the tillandsia, about which you inquire; it hangs from almost every tree, and we saw it in quantities along the banks of the St. Lawrence, before we reached Quebec. The captain of our vessel told us it was used in the States to stuff beds; and that he had carried some home to his wife for the same purpose.

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' *July 1st.*— I must give you a sketch of the manner in which we pass our time. Mr. * * * goes out at five, and returns to breakfast at seven; he then works at his farm till twelve, when dinner is ready; after which he rests some time, and again works till eight, when I summon him to coffee. Household cares and preparations occupy me all the morning, and teaching the children, and working for them, the rest of the day. After they go to bed I have a nice hour for writing or reading.

' It is the custom for the ladies in this country to dress in the morning very plainly, and suited to the hard work in which we must all

take a part ; after dinner they put on silk gowns and smart caps, and either go out to pay visits, or stay at home to receive them. But we live in such perfect solitude in these woods, that we have no neighbours to go to, or to expect here. We are going on as yet with smiling prospects, and doing something every day that tends to our comfort ; but we must be contented to advance very slowly.

‘ In spite of every effort, my thoughts too often turn to dear *home* and to former times, or sometimes they take a far stretch forward ; but these are only airy visions which I do not encourage. Yet I cannot help praying that we may be permitted to meet again in a few years. I fear setting my heart too much on this, but I trust to the support of Providence under every disappointment, and under every trial. Trials we must have in all places, still more in these dreary woods.’

29th.—I heard lately that several of those greenhouse plants which are natives of swamps, if planted in a pond, the bottom of which never freezes, would grow as well as if in their own country : I have therefore asked permission to try this experiment, and my aunt let me have a plant of the long-leaved *amaryllis*, and one of the Ethiopian *calla*. We broke the pots they were in, that the roots might not be disturbed,

and then put them into small open baskets, with a fresh compost round them. My uncle had places made in the bottom of the pond, which is about two feet deep, and the baskets were plunged into them, and the soil at the bottom drawn close round.

The gardener thinks the salt dross has been effectual in destroying the wire-worm in my carnation beds ; so last week he added a small quantity of sharp sand, and then the beds were dug, and raked nicely for planting. Yesterday and this morning I have been busy planting out my layers ; and as I stirred the ground with my scoop trowel, I could perceive no traces of my old enemies.

A few weeks ago I raked off half the layer of peat earth, with which I had covered my ixia, gladiolus, and oxalis beds, to preserve them from the frosts ; I have now raked off the other half, and the beds being carefully forked up, I hope, in May, to have some nice flowers there.

This is a most busy time in the garden, forking and dressing the borders, mending the edges, earthing up peas and beans—continually watching and defending the blossoms of the wall-fruit, pruning trees, preparing hot-beds, and sowing cauliflower, lettuce, onion, broccoli, radishes, &c. &c. ; and in *our* garden, planting out flowers and removing offsets ; dressing and protecting the beds of spring flowers that are

going to blossom, and sowing sundry annuals. In short, everything is alive, and everybody anxious not to lose a moment while the weather is so favourable.

30th.—I have been reading all the accounts I could find of ants ; and am surprized to find how many curious circumstances there are in the history of some of the species of this country, and of France.

Frederick knew where there was an ant-hill, and took me there, when they began to revive, on a sunny day, a few weeks since. We observed numbers coming out of the ground, as if roused by the warmth, and assembling in crowds on the top of their nest ; they were in continual motion, walking over it, and even over one another, and yet without quitting the spot. This lasted for a few days, and then they began to repair the upper stories of their dwelling, which had been spoiled by rain and snow. We frequently watch them, and they appear to be incessantly engaged at this work till it is quite dark.

They certainly give us an example of perseverance ; but their foresight in laying up a store of grain for winter, is now considered to be an unfounded idea ; for they are nearly torpid during the winter, and do not require provisions. May it not be said, however, that they show

forethought and contrivance in regard to their friends the aphides, which I mentioned some time ago in my journal?

The yellow ant, for instance, which seldom leaves its home, and likes to have its comforts within reach, usually collects in its nest a large *herd* of a kind of aphid, that derives its nutriment from the roots of grass. These are conveyed by subterranean galleries into the nest, so that, without going out, it has a constant supply of food. The ants bestow as much care on these little milch-cows as on their own offspring, and pay particular attention to their eggs, moistening them with their tongue, carrying them tenderly in their mouth, and placing them in the sun to be hatched. When Frederick opened one of the ant-hills, we observed a parcel of these little black eggs very near the surface; and the ants were so distressed at our visit, that they immediately began to carry the eggs to the inside of the nest. By hatching these eggs early, they provide future food for their own families; and I am sure that is showing forethought. This aphid yields a great quantity of that sweet fluid of which the ants are so fond; it flows from two hair-like tubes, placed one on each side, and the ants, who watch for the moment when it is ready, suck it down immediately. It is said, that the ants can make the aphides yield this fluid at any time by patting them with their antennæ; and

when they have milked one of their little cows, they go to another.

As to all the varieties of the tropical ants, the inhabitants of South America know but too much of them already ; but I must tell you of a use to which, in another country, their nests have been applied, and which you could scarcely have guessed. In the southern part of Africa, they raise solid nests of clay, in shape like a baker's oven. The Caffres, when first permitted to settle at Gnadenthal, one of the Moravian settlements, converted these tumuli into ovens. Having expelled the inhabitants by smoke, they scooped them out hollow, leaving a crust of a few inches in thickness ; and then used them for baking their loaves. The clay of which these nests are formed is so well prepared by those industrious animals, that it is used for floors of rooms by the Hottentots, and even by the Dutch farmers.

April 1st.—The little buds of pear-blossoms, which I told you had enlarged so much, have this day blown out completely. They are, I do think, a curiosity. They have been now about two months in water, but they had lain dry so long before, that one might have thought no life remained in them. The horse-chesnut leaves, which first came out, begin to droop ; but on one of the twigs there is a nice young shoot, at least two inches long, which looks bright and fresh.

The lilac buds, I am sorry to say, have withered; but some of the ash leaves have opened out finely: three of them, however, were curiously twisted, and filled up with a cottony substance, which, on examination, was found to contain a little greenish insect. Mary thinks it is the *aphis fraxina*. What a long time the eggs must have remained there, for I do not think an *aphis* could have found out this branch in my room!

2nd, Sunday.—Deuteronomy, the title of the fifth book of the Pentateuch, is derived, I find, from two Greek words, which signify the second law, or rather the repetition of the law. Mishnah, the name the Jews give it, has nearly the same meaning. ‘Moses, in this book,’ said my uncle, ‘not only recapitulates the laws he had already ordained, but makes several explanatory additions, and enforces the whole by the most earnest and impressive appeals to the gratitude, the hopes, and the fears of the people. To them it is principally addressed, as most of what particularly related to the priests is omitted; and as it was drawn up in the last year of their abode in the wilderness, we may suppose that it was intended as a compendium for the benefit of the new generation, who had not been present at the first promulgation of the law.’

‘It is remarkable that, in the preceding books,

Moses speaks of himself in the third person ; but in Deuteronomy he drops the assumed character of an historian, and addresses himself to the nation in the animated language of a prophet, and with the authority of their chieftain and lawgiver. He begins by reminding them of the many circumstances, since their departure from Horeb, in which they had experienced the Divine favour ; and then contrasts the success and the victories that had marked their progress, with the disobedience and ingratitude that had provoked the Divine wrath. He frequently alludes to his own guilty conduct, and to the inexorable decree by which he was debarred from accompanying them to that land of promise, for which he had so zealously toiled. He dwells on every circumstance that could improve their hearts, and earnestly enjoins the succeeding judges of Israel to do strict justice, and to inculcate the principles of obedience and piety. He rehearses the commandments which he had delivered to the people direct from God, and exhorts them by every possible argument to fulfil the terms of that covenant which the Lord had made with them. While he affectionately urges their future obedience, and severely reproaches their past misconduct, he loses no opportunity of unfolding the glorious attributes of Jehovah, and dwells on His mercy and compassion, and on

His promised blessings. He then enters into a new covenant with the people, which includes that previously made at Horeb, and ratifies all the assurances long before given to Abraham and his descendants.

‘The historical part of Deuteronomy contains a period of only two months; and concludes the life of Moses, that truly great man and faithful servant of the Most High. His parting words to the people whom he had so long and so anxiously governed, were expressed in a hymn that is pre-eminent for the beauty and strength of its composition. It briefly but pathetically reiterates his warning exhortations, and ends with a repetition of the particular blessings promised to each tribe. His race being now run, we are told by the writer who finished this book, that Moses retired to the top of Mount Nebo, from whence he was permitted to behold the land which the Lord had declared the seed of Abraham should inherit; and he there died in the 120th year of his age, and in the year 2552 of the world.’

The coming of Messiah is more explicitly foretold in Deuteronomy, my uncle says, than in any other book of the Pentateuch; and the prophecies of that great event, as well as of many other circumstances in the history of the Jews, have been so fully and minutely realized, that they completely demonstrate the Divine inspiration of Moses.

3rd.—Besides the rocks which compose our five grand formations, there is another series, the *trap* formation, or *overlying* rocks; so called, because they are found in various places, lying on almost every rock, from granite even to chalk. They sometimes traverse the other rocks in *veins* or *dykes*, and are sometimes found in immense shapeless masses, but never regularly stratified. It is evident, from these facts, my uncle says, that their origin must be more recent than those rocks on which they repose; yet they are quite free from all organic remains—none, either animal or vegetable, having yet been found in any rock of this class in England, nor, he believes, in any part of the world.

These circumstances have given rise to much discussion, as to the original formation of these trap-rocks, whether by fire or by water; but that is a subject on which my uncle will not yet allow us to touch. Some species of this family have the appearance of crystallization; green-stone trap, for instance, has large distinct crystals of felspar; in others, every trace of distinct crystals vanishes, and the whole assumes a dull earthy appearance.

The famous basaltic rocks, of which there are such singular specimens in Scotland and Ireland, belong to this family; but I shall be able to tell you much more about them in a few months, my dear Mamma, for my uncle says it will be

necessary for him to visit Ireland, and he proposes to take us all with him, to see the Giants' Causeway. You will be surprised at this, but pray do not be alarmed; I assure you there is no danger now from the wild Irish. My uncle has been there already, and, from what he says, I think some parts of that country must be very interesting. I am so full of the idea of our Irish travels, that I can write no more to-day.

5th.—I have had another long walk to-day with Miss Perceval, and, therefore, another charming conversation. The infinite variety in the vegetable kingdom was our chief subject.

'Plants,' she said, 'have not been thrown at random over the surface of the globe; in every region we find those which are best adapted to each particular situation. Every climate, and every soil, has some peculiarity which influences its plants; and every plant seems to be subservient to some great and important object. From the brilliant profusion of vegetation in some countries, down to the stunted lichen, which just colours the rocks in others, every change points out the beneficence of the Creator; and those who endeavour to comprehend this beautiful order, and who trace these arrangements to the general system of Providence, can alone enjoy the study of botany in its full extent.'

She then told me a great deal about this dis-

tribution of plants, and mentioned many of the circumstances which appear either to fit them for the different regions of the earth, or to render them useful in supplying the local wants of the inhabitants. She began with the low plants whose small, close-set leaves resist the intense cold of high latitudes, or of stormy mountains; and, tracing the gradual increase in the size, as well as in the number of native plants, through all the intermediate climates, she ended with the great stems, gigantic leaves, and splendid flowers of the torrid zone.

‘A similar change,’ she added, ‘may be observed in those adjective races of plants which depend upon others for support and protection. Instead of the dwarf mosses and lichens which clothe the bark of trees in colder countries, the luxuriant parasites between the tropics may be almost said to animate their trunks. Delicate flowers spring from the roots of the chocolate and calabash trees; and, amidst the abundance of flowers and fruits, and the confusion of parasites and climbing plants, the traveller is at a loss to determine to what stem the leaves and blossoms belong. Humboldt describes a species of *aristolochia*, whose flowers are four feet in circumference; but Sir Stamford Raffles discovered a flower belonging to a parasite plant in the island of Sumatra, that was nearly ten feet in circumference. He brought home an exact

model of it, which is now in the apartments of the Horticultural Society, and which your uncle told me he saw and measured when he was last in London. It has five petals of a deep red colour, and of a very solid, fleshy substance, from a quarter of an inch in thickness at their outer lip, to almost an inch at their base; and he understood that, when the flower was first cut, it weighed fifteen pounds. The nectarium is so large and deep, that he thinks it would hold eight pints of water; and the whole diameter of this giant flower he found three feet and two inches.'

I interrupted her, to ask the name of this wonderful plant.

'It has been justly called, after its lamented discoverer, the *Rafflesia*. A model was an excellent method of making us acquainted with its appearance; for the northern nations can have but a faint idea of the majestic forms of tropical vegetation from mere drawings and descriptions; and still less can they judge of them from the sickly plants in our stoves and greenhouses.'

This is just what I have myself thought a hundred times, Mamma. I then asked her about the *Cactus* tribe, of which we have so many singular-looking species in Brazil.

'It is, indeed,' she replied, 'a most grotesque family; some with their round backs and spines, resembling a hedgehog, while others appear like the pipes of an organ rising into

long channelled columns. They are almost entirely confined to the New World, one species only being a native of the south of Europe. This is the *C. opuntia*, or prickly pear, which bears on the edge of its leaf an agreeably flavoured fruit. The *melo-cactus* has been named by St. Pierre the Vegetable Spring of the Desert ; its shape is spherical, and though half concealed in the sand of the parched plains in South America, the animals, who are always tormented by thirst, discover it at a great distance, and, notwithstanding its formidable prickles, greedily suck the refreshing juice with which it abounds.'

From the rich vegetation of America, we went to New Holland, and she told me that though but little of the interior has been yet explored, numbers of vegetables, totally different from those of America, though in the same degrees of latitude, have been found there. ' They seem to have quite a separate character ; and those that are suited to the nourishment of man, are as rare in that country as they are common in America. The forests of New Holland, where the axe has never been heard, and where vegetation extends itself without restraint, are described as having a very singular appearance ; the trees crumbling with age, and covered with mosses and lichens.—Among their most beautiful productions are the *mimosæ*, the superb *metrosideros*, and the whole tribe of *eucalyptus* ; many

of which are from one hundred and sixty feet to one hundred and eighty feet in height.'

I asked Miss Perceval whether South America or India had the greatest number of plants. 'India, I believe,' said she; 'its inhabitants have been so long in some degree civilized that, in addition to its native vegetation, many plants must have been naturalized, and many varieties produced by culture; and India exclusively boasts of the perfume of the most precious spices.'

'But there is another part of the world which we must not forget,' continued Miss Perceval, 'where nature seems to delight in multiplying the species belonging to each genus. I allude to the Cape of Good Hope, where the silvery lustre of the innumerable families of the *proteaceæ* gives to the woods an appearance quite unlike those of either Europe or America. The heaths are almost infinite in variety; the geraniums are scarcely less so; and the gladiolus, the ixia, and the whole order of *irideæ*, decorate the fields and thickets of the Cape, with an exuberance unknown in any other country.'

'To form a just view of vegetable nature, we must observe it in those countries where the ground has not been turned by the hand of man. Few such spots are now to be found in Europe, except on the summits of the Alps and Pyrenees. There, mountains piled on mountains, rising above the clouds, form so many gardens, fur-

nished with a vegetation of their own, and the character of which changes with the temperature at each degree of elevation. The same gradation takes place on all other lofty mountains ; and in Frazer's account of the Himālā chain, which separates Thibet from India, there is a long list of English plants that he found there, at the altitude which corresponds with our temperate climate ; such as horse-chesnut, birch, and apricot, strawberries, raspberries, lily of the valley, and many others ; and still higher up, he even saw the famous Iceland lichen.

6th.—Yesterday, Mr. Lumley and Mr. Maude dined here ; and, in conversing about the new books which Mr. Maude has just brought from London, he spoke very highly of Sir John Malcolm's ' Sketches of Persia.' He mentioned several interesting anecdotes which he found there ; and to entertain Wentworth, he related some of the exploits of Roostem and his wonderful horse Reksh ; of which you shall have the following as a specimen.

' All countries have their fabulous heroes, and Persia had her Hercules in the renowned Roostem. He undertook the deliverance of his sovereign, who was a prisoner in Hyrcania, and set out alone on his good horse Reksh. Fatigued by his first day's journey, he lay down to sleep, having turned his horse into a neigh-

bouring meadow. There Reksh was attacked by a furious lion; but after a short contest, he struck his antagonist to the ground with a blow from his fore-hoof, and completed the victory by seizing the lion's throat with his teeth. When Roostem awoke, he was more enraged than surprised that Reksh, unaided, should have risked such an encounter. "Hadst thou been slain," said he, "how should I have accomplished my enterprise?"

This story produced a grand discussion. Some doubted the power of the horse to strike such a creature as a lion to the earth. Wentworth quoted different books of travels to prove that horses always trembled with instinctive dread at the sight of a lion; and even Mr. Maude, highly as he estimated the courage of a horse, did not seem to think him capable of such a noble effort. I thought to myself that it was perfectly suited to the other fabulous adventures of Roostem.

My uncle waited to hear everybody's opinion, and then said, 'I will tell you a singular circumstance which an old friend of mine witnessed, when he was at the King of Sardinia's court, at Turin, about forty years ago. Perhaps it may convince some of my young sceptics, not of the truth of Roostem's exploits, but at least of the strength and spirit of horses. The king had a remarkably fine charger, but so untameably vi-

cious, that, after having killed two grooms, he was ordered by his majesty to be shot. It was suggested, however, that as he was to die, it would be a good opportunity of putting to the test the bravery and vigour of a horse whose spirits had not been subdued by being domesticated; and the king readily consented that he should be turned loose into a well-secured arena, along with a ferocious lion that belonged to the royal menagerie. Arrangements were soon made; and both these animals were allowed to enter at the same moment through opposite doors. They approached a few steps—then stopped, as if to take a survey of each other—and again they advanced, but very slowly, till almost close. There was now a pause for a moment; after which the lion stooped a little as if meditating an upward spring, in order to fix his dreadful claws in the neck of his adversary; but the horse seized the opportunity, and making a slight but deliberate plunge with one leg in advance, he struck the lion on the head, and with such fatal force as to lay him dead at his feet.'

'The remarkable pause,' said Mr. Lumley, 'which was made by those two noble creatures is, I believe, the practice of all combative animals when going to make their onset. I cannot give you better authority than that of our highly valued friend, Major R., who, you know, was not less remarkable in India for his scientific

knowledge and military talent, than for his intrepidity. In the course of service he had frequently been sent with a detachment, to drive away from the wheat-fields and jungles the tigers that often prowl about the camps or even enter the villages; and he bears terrible marks to this day of the danger of such an employment. He has lately told me, that more than once he has owed his safety to that *moment* of observation when the animal seemed as if collecting his force; for, as it always took place at a very short distance, he seized that favourable pause, while his foe was stationary and steady, to take a deliberate aim at a mortal spot.'

7th.—In describing the changes that have been produced by the action of the deluge, my uncle has often dwelt on the vast force of large bodies of water, when moving with rapidity. He supposes that most of the vallies have been scooped out by those means; and he divides them into two classes: *longitudinal* vallies, or those which lie parallel to the chains of hills; and the *tranverse* vallies, which intersect the chains. Caroline and I frequently talk over what he tells us, and we agreed to ask him, in our walk this morning, why the violence that tore out the vallies did not disturb the hills at the same time.

'Those mighty currents,' he replied, 'naturally made their first impression on some weak

part;—the fragments that were thus detached assisted in excavating a channel as they rushed forward; and the more the water was confined to a channel, the more powerful was its action. But the hills have also been disturbed more or less; for the upper strata appear to have been swept off from extensive ranges that they once covered. This is proved by the separated hills, which geologists call *outliers*; and which, having the lower strata exactly continuous with those of the adjacent range of mountains, but wanting the superior strata, show that the same convulsion which broke through and carried away the connecting parts, must also have torn off their summits. Another proof is the great quantity of their *debris*, or broken fragments, which are found scattered over parts of the country far distant from their original positions. In the gravel-beds near London, I have found pieces of basalt, though that species of rock is not known to exist within a hundred miles of the county of Middlesex.

‘These fragments,’ he continued, ‘must, therefore, have been transported by some agent that was equal to tearing up and carrying away the parent rock; and when it is considered that all gravel must have had its edges and angles rounded by the rubbing of stone against stone, you will perceive that this could only have been effected by the violent and long-continued action

of currents of water ; in short, by the tremendous surge and confused motion which accompanied a general deluge. That this deluge has been comparatively recent is clear, from the fact, that fragments of primitive and secondary rocks are often found promiscuously mixed in the same bed of gravel. In one large bed, near Lichfield, may be found fragments of almost every rock in England, from chalk to granite ; and many of the pebbles contain organic remains.'

We spent a couple of hours wandering up and down some of the valleys in the neighbourhood ; and though a cultivated country is not the best theatre for a geological lecture, my uncle contrived to show us so many corresponding circumstances on the opposite sides of one of the transverse valleys, that it was quite evident to both of us, that the ridge had been formerly uninterrupted. We saw, also, many examples of the gravel he had mentioned, all more or less rounded and smoothed, and containing specimens of very different series. This was a delightful walk ; for though one may acquire very fine ideas, at home, of the operations of nature, there is nothing like seeing them in their proper places.

As we returned home, my uncle told us that this water-worn *debris*, which covers many parts of the earth, is named *diluvium*, from that great and universal catastrophe by which it appears to

have been formed. This name is meant to distinguish it from the more modern debris daily produced by rivers and torrents, to which the name of *alluvium* is given.

‘ Diluvial gravel is highly interesting,’ he said, ‘ not only as it assists in explaining the causes of the present state of the globe, but as it even indicates the direction of the great currents of the deluge. For instance—when, within a few miles of the neighbouring town of Gloucester, we see rounded pebbles derived from rocks, which are found only in the mountains of the north-west of the island, we may be sure that a branch of that current must have rushed to the southward. It has, therefore, been a favourite object of some geologists to trace these travelled fragments to their native masses ; and to discover the apertures in the mountain barriers through which they had been swept.

‘ When the intervening country is nearly flat, there is no difficulty in ascribing the removal of the debris to the currents of which we have been speaking. But it is frequently found in situations that are separated by deep vallies from the parent hills from which it appears to have been torn. For instance, fragments of the primitive rocks that compose the Alps are found scattered on the sides of the Jura mountains, though, between those two ranges, the valley that contains the lake of Geneva is interposed. On the

low hills, near Bath, we find the flints belonging to the chalk formation, though several deep vallies intervene. Many other examples might be given; and the way in which geologists obviate the difficulty is, by supposing that one set of currents tore off and transported these fragments, and that a *subsequent* rush of the waters excavated the vallies.'

My uncle ended by saying, that when the weather was more settled he would show us a part of the country at no great distance from Fernhurst, which would make us more clearly comprehend this interesting subject.

8th.—The wonderful way in which the use of tobacco has spread into every country of the world, in less than three centuries since its first discovery in America, happened to be mentioned in conversation the day Mr. Maude spent here; and we were all amused by his account of the mode of smoking in Turkey. The sumptuous pipes in fashion there are so unlike the little cigars in everybody's mouth in Brazil, that perhaps his description of them may entertain both you and Marianne.

The Turkish pipe, which is called a *chibouque*, consists of the tube, the bowl, and the mouth-piece, so that they are all easily separated and cleaned. The manufacturers of the tubes are seen at work every day in the shops of Constan-

tinople, where there is a bazaar, or street of shops, entirely for their sale. They are made from the young straight stems of cherry-tree or jessamine, on which the bark is carefully preserved; they are from two to six feet in length, and are nicely bored with a wire auger. The nursing these stems, during their growth, is often the support of a whole family, and requires a good deal of attention. To prevent the bark from splitting in the heat of the day, each stem is swathed with wet bandages, and the least tendency to become crooked is counteracted, either by a judicious application of the bandage, or by more copiously watering the plant on one side than on the other. A perfectly straight stem, with a uniformly shining bark, is, however, a great rarity, and sells for about two guineas.

The bowls are made of a clay called kefkil, found in Asia Minor and in Greece. In its native state, it is soft and white, but when baked, it becomes hard; and, unlike the English pipe-clay, turns to a black or red colour. These bowls are made of all sizes; the Turks do not like them very large; but those exported to Germany, where they are polished and finished with great elegance, are as large as a man's hand. Mr. Maude says he was astonished by the piles of bowls in every shop of the bazaar.

The bowls are frequently ornamented with gilding, and the tubes with embroidery and jewels;

but it is on the value of the mouthpiece that a Turk prides himself. None but the miserably poor would use anything but amber ; and though the common sort are cheap enough to suit all ranks, Mr. M. has seen some which have cost a hundred pounds, not from their size, but from some favourite tinge in their appearance.

‘ With such a pipe,’ he says, ‘ and with Saloniki tobacco, a Turk is supremely happy. Cross-legged on his Persian carpet, he enjoys it the whole day, and except to call for more tobacco, or for a cup of coffee, he seldom opens his mouth, as the smoke is emitted, from time to time, in long cloudy columns from his nose. Pipes take the lead in every visit, and are preliminaries to every conversation. The most flattering compliment a Turk can pay to his guest, is to present him with his chibouque warm from his lips ; and I shall never forget the mixed look of indignation and contempt which a Pashaw of three tails threw at an Englishman, who unwarily wiped the superb amber mouthpiece before he introduced it between his own lips.’

9th, Sunday.—‘ Hear, O Israel : The Lord our God is one Lord : and thou shalt love the Lord thy God with all thine heart, and with all thy soul, and with all thy might. And these words which I command thee this day shall be in thine heart : and thou shalt teach them diligently

unto thy children, and shalt talk of them when thou sittest in thine house, and when thou walkest by the way, and when thou liest down, and when thou risest up.'—Deut. vi.

After reading the whole chapter, my uncle called our attention to the above verses, and said, 'The characteristic excellence of the Mosaiical law consists in the inward principle on which obedience to it was founded; in other words, on the love of God. This is fully unfolded in the admirable commentary of Moses on the commandments, where we see that the love that is expected from us must be accompanied with the full vigour of our feelings; and that it must be daily excited by a constant and grateful sense of the long-suffering and forbearance we have already experienced—of the blessings we still enjoy—and of the promises held out to us by a God of mercy, of goodness, and truth. This is the love which should be the principle of all our motives, and the guide of all our actions. This is the love which expands our hearts, not only into grateful adoration towards the Author of our being, but into benevolence towards our fellow-creatures. "Thou shalt love thy neighbour as thyself; I am the Lord." This emphatic conclusion shows that we are bound to do so for the Lord's sake; and throughout the Mosaiical law you will find that the love of God was made the basis of the love of our neighbour, as

well as of all our other duties. In the same manner, our Saviour declares that on these two commandments hang all the law and the prophets ; that is, the whole religion and morality of the Old Testament.

‘ It appears,’ continued my uncle, ‘ to be peculiar to the Jewish and Christian dispensations to have solemnly laid down the principle of the love of God, as a ground of human action : for, though some wise and excellent heathens had certain elevated ideas of the Deity, none seem to have inculcated the love of the Deity as a governing motive of human conduct. This Moses did most expressly ; and Christ not only adopted and ratified what the law had already declared, but singled it out, and gave it pre-eminence over the whole body of precepts which formed the old institution.

‘ Let this noble principle then be pre-eminent in our minds ; let us, who enjoy so many social comforts at home, and who have been happily taught to behold in our walks the beauties of this beneficent creation ; let us, who can lie down to repose in health and security, and who can rise up refreshed to perform our duties ; let us, my children, fill our hearts with the love of God ; and let it purify our thoughts, direct our words, and govern our actions.’

10th.—I find great amusement in watching

the young birds that are now coming out, and in observing the tender care with which their parents feed them. There are several nests in the tall trees near my window ; and, in a thick bush in my quarry-garden, a favourite robin, who used to hop on my hand, and feed there, all the winter, has four young ones : I have named them after Mrs. Trimmer's dear little redbreast family, of which Marianne and I were so fond.

Robins seem less afraid than most birds of the human haunts ; and my aunt says she has a friend, in whose bedchamber a pair actually built their nests, and brought up their young till it was time to fly away. The lady used to leave her window open all day ; and often sat there to watch their manœuvres, and to listen to their sweet song. They seemed to be aware of their comfortable quarters, and fiercely attacked any other birds that intruded themselves.

She also mentioned a singular circumstance of a wren, a bird that is never very familiar. A gentleman having occasion to repair some paling that was attached to an old hollow yew-tree, the workmen discovered a nest in a small hole in the stem, with nine little unfledged birds. He was fortunately on the spot, and had it placed on the window-sill of his study. The old wrens soon followed ; and, even when it was taken into the room, or held in the hand, they boldly did their duty to their offspring. They repeated their

visits for sixteen hours daily, coming every two or three minutes with fresh supplies of food, which the little things greedily devoured. When this was told, I well remembered having heard grandpapa tell it of himself long, long ago.

This season, I suppose, must be remarkably forward, for we have had quantities of primroses and other flowers already, though Warton says of the first of April,

Scarce the hardy primrose peeps
From the dark dell's entangled steep.

I should tire you with the long list of leaves or flowers opening or already burst out; but I have kept a very exact account of them in *my* naturalist's calendar; and when you come home, Mamma, you shall see it, and we shall be able to compare it with the advance of spring in some other year. Spring is really delightful; the great change from winter is so animating, and so full of interest to the gardener and farmer.

My hyacinth and jonquil beds are in great beauty; and, without vanity, my garden looks so well, that not only my cousins, but even my aunt and uncle, congratulate me on my industry and success.

Franklin is very busy now in every part of his farm; yet he pays constant attention to the workmen who are building his house, which is already far advanced: he says it is inconceivable how much waste he prevents by keeping his eye

on them. Little Charles is beginning to be useful; his understanding is quick, and he already speaks plain English. The Franklins keep him always with them, without seeming to watch him, in hopes of breaking the habit of pilfering. His relations are not inclined to take him, so that my aunt will have a full opportunity of trying her benevolent experiment.

11th.—Caroline and I had a long walk, and a long conversation to-day with my uncle, about the *alluvial* changes on the surface of the earth. I wish I could tell you all he said; I can only give you a little sketch of it,

‘ Since the last great and general convulsion produced by the deluge, many gradual changes have occurred, and are every day occurring, from causes which we may easily trace. We see destruction going on in one place, and new formations in another; we find headlands and cliffs undermined and washed away by the incessant action of the waves; and we as often find the materials, thus carried off, thrown up again, and forming, either extensive tracts of new land along the less exposed parts of the coast, or new banks and shoals in the adjoining sea. The action of frost and snow, and rain, have all a similar tendency: ice, by swelling in the rifts and crevices of the rocks, detaches small portions; the rain washes away the finer parts; the

melting snow, which forms the winter torrent, carries down the larger fragments, and, dashed against each other, their angles are rounded off. The looser materials of the soil, through which these torrents pass, are still more easily swept away; and in this manner, year after year, the surface of the mountain is conveyed into the valley. As the torrent reaches the level ground, its rapidity lessens, the larger fragments proceed no farther, and only the earth and sand reach the river, where they subside to the bottom, and form alluvial flats, and push out the *deltas* which may be seen at the mouths of almost every river. Some of the prodigious deltas made by the great rivers of the continent, I think I mentioned to you in one of our earliest conversations, as well as the great deposit of new land on the coast of Italy.

‘ Fortunately, over a large part of the earth’s surface, these wasting causes have no influence; the green sward which clothes it is an effectual protection. The barrows of the ancient Britons, though above two thousand years old, retain their original outline, and the fosse surrounding them is still distinct. Even on the sides of mountains, where the causes which I have described are always more or less in operation, still there is a degree at which further waste will be checked; the abrupt precipice may in time be broken down into a slope; but vegetation will creep up,

and that slope will then be defended by its grassy coat.

‘ Even the mighty action of the sea has a similar tendency to impose a limit to its own ravages ; for it wastes its fury in vain on the barrier of loose stones which it had beaten from the cliff that they now protect.

‘ On some coasts, however, the agency of the sea does produce an injurious change. Where the shore is low, and consists of a flat, sandy bottom, the sand is thrown up by the surf ; at every reflux of the tide, it becomes partially dried ; the winds blow it higher up, and thus ranges of sand-hills are formed parallel to the beach. They encroach on the land so rapidly, that districts, which a few years ago were inhabited, are now become desert plains of sand. This takes place on a large scale, in many parts of the world ; even in Norfolk it has been found that the only means of arresting the progress of the sand is to plant thick hedges of furze. On the east coast of Scotland, much property was laid waste by this destructive enemy, whose advance was occasioned about a hundred years ago, by the imprudent removal of the trees and the *bent*-grass which grew on the sand-hills. The effects were so alarming, that an act of parliament was made in the reign of George II. to prohibit the destruction of that useful plant, the sea bent-grass, which Providence has kindly

formed to grow in pure sand, and to keep it firm. The Dutch may be said to owe their existence to it, as its spreading matted root fixes the sand on those great dykes or embankments, which alone preserve the country from the inundations of the sea. This grass is called *murah*, in the Highlands, on the coast of Lincolnshire, *signs*; in Norfolk, *matgrass*; and by Linnæus *arundo arenaria*. It has long sharp-pointed leaves, and fortunately no cattle whatever will taste it. The sea erylgo, and the creeping restharrow, contribute also to defend us against these almost irresistible sands.'

When we returned home, my uncle showed me an extract of a letter from the unfortunate traveller, Bowdich; containing an interesting account of a sandy plain in Madeira, about eighteen miles from Funchal. I must copy a part of it for my dear Mamma.

'From Caniçal, by following a rough track, on the margin of shallow cliffs, of alternate tufa and basalt, for about a mile and a half, we reached a depression, more like a basin than a plain, and covered with a deep bed of sand. This sand has, in some degree, been fixed by the numerous branches of the forest-trees which it has enveloped, and which are spread over the surface as well as beneath it, like a net-work of roots. Both the branches and the trunks are encased in a thick hard sheath of agglutinated sand; and

in some instances, the wood having entirely perished, the envelopes are found empty, like tubes. Most frequently, however, the wood is still found within, where it has become a hard, petrified mass.

‘ The trunks, which remain in their natural position, have been broken off about a foot above the surface of the sand : how far they reach beneath it I cannot say, but there were two or three as thick as my body. They all appear to belong to the same species of tree, though of what family I do not think our present knowledge of the comparative anatomy of timber is sufficiently advanced to determine.

‘ This deposit of sand extends about three-quarters of a mile in each direction ; and as innumerable fossil marine shells are mixed with it, as well as embedded in the envelopes, it must evidently have proceeded from an irruption of the sea, although it is bounded by hills several hundred feet high, on which there is no trace of sand.’

12th.—My aunt was so kind as to take Mary and me with her this morning, to pay a visit to Mrs. B., who has always many pretty curiosities to show. Her cousin, who is captain of an East Indiaman, has a constant commission to bring her any thing that is interesting. Fortunately for us, he arrived a few weeks since, and has lately sent her a collection of Chinese drawings.

of flowers and insects, which are most beautifully coloured. They are, however, amusingly defective in regard to proportion; for some of the flowers are much diminished, while the insects upon them are represented of their natural size.

He brought her, also, a few stuffed birds; one of which, the adjutant bird, is such a prodigious creature, that I scarcely looked at the others. It measures from the crown of the head to the foot, five feet two inches; from tip to tip of the wings, fourteen feet; and the other dimensions are proportionably great. Its general colour is black, or slate-blue, though a few of the small feathers round the neck, and on part of the body, are white.

It is called the hurgill, in Bengal. They say that when alive it majestically stalks along, and looks like an Indian; and when seen near the mouths of rivers with extended wings, might be taken for a canoe. There is a curious superstition among the Indians, that the souls of the Brahmins possess these birds. They are very ravenous, and have a most capacious stomach, as well as a large craw, which hangs down the fore part of the neck like a pouch. The captain told Mrs. B., that in the pouch of one which was killed, a land tortoise, ten inches long, was found, and in the stomach, a cat; even a leg of mutton, or a litter of young kittens, are easily swallowed. He heard of one that had been caught when young:

he was easily tamed, and being always fed in the hall, he became so familiar, that at dinner time he stood behind his master's chair; but the servants were obliged to watch him, as sometimes he would snatch a whole fowl off the table. He used to roost among the high trees, from whence, even at two miles distance, he could spy dinner carrying across the yard, when, darting home, he regularly walked in with the last dish. As he stood near the dinner table, he appeared as if listening to the conversation, turning his head alternately to whoever spoke.

The most curious thing about this species is the pouch. Dr. Adam, of Calcutta, supposes that it helps to sustain the birds in their great flights in the air, and also assists them in the waters in searching after their prey. From the structure of their limbs they cannot swim; and it appears that they have the power of distending this bag with air when they go beyond their depth. He says, that in the month of October, when the sky is not obscured by a single cloud, it is a beautiful spectacle to observe hundreds of these birds, performing their graceful evolutions at a vast height above the earth; with a telescope, however, he could not perceive whether the bag was distended.

This huge bird occupied so much of our visit, that I scarcely recollect any thing else that I saw.

13th.—My aunt has been reading to us several interesting particulars of the Hottentots, from Latrobe's Journal of his visit to South Africa.

There is a striking difference, he remarks, in the conduct of the uncivilized, and of the Christian Hottentots. All those who have been converted by the Moravian missionaries have learned some useful trade, and, when they like their employment, work very industriously. They are naturally kind-hearted and obliging; and Christianity has had such a happy effect on them, that they live at the settlement of Gnadenthal united as brethren amongst themselves, and very grateful to their teachers.

The Hottentots have fine voices; they are fond of music, and are easily taught to sing. 'One morning,' Latrobe says, 'at four o'clock, I was awakened by the sweet sound of Hottentot voices singing a hymn in the hall before my chamber door. They had learned from some of the missionaries that it was my birth-day, and I was struck and affected by this mark of their regard; nor was their mode of expressing it confined to a morning song. They had dressed out my chair at the common table, with branches of oak and laurel; and even the school-children, in order not to be behind in these kind offices, having begged of their mistress to mark on a large white muslin handkerchief some English words expressive of their good will towards me, they ma-

naged to embroider them with a species of creeper called cat's thorn, and fastened the muslin in front of a table, covered with a white cloth and decorated with festoons of field flowers. This table, on which stood five large bouquets, I found in my room, on returning from my walk. The whole arrangement did credit to their taste. The words were, " May success crown every action."

14th.—I asked my uncle, yesterday, whether a considerable change has not been produced in the level of the ocean, by the vast quantity of materials, which he had told us were carried into it by the rivers, and washed away from the coast by the waves.

He replied, that it was a very natural question, and showed that we reflected on what we had learned. ' But,' said he, ' though the quantity of materials which has for ages been accumulating in the sea must be vast, yet, when compared with the capacity of the whole ocean, its disparity is so obvious, that it probably can have had no visible effect in elevating the general level of the water. I say the general level, because it is possible, that in the mouths of large rivers, and in narrow seas, it may have had some effect in raising the level of the flood tide ; for the actual volume of water rolled in from the sea continues the same as it was formerly,

but the space over which it has to diffuse itself being less deep and less broad, it must, therefore, force itself to a higher level. Other causes, however, may lead to the permanent rise of the sea in certain places; for instance, it is possible that the current which unceasingly rushes into the Mediterranean, may, in the course of centuries, have gradually widened the entrance, and consequently a greater quantity of water now pours in. This, combined with the deposits from the Rhone, the Po, the Nile, and other rivers, may, perhaps, account for the well known fact of the eastern end of that sea being now higher than it was formerly; many foundations of houses, and other vestiges of buildings, being visible there several feet under water.

But none of these causes will account for the extensive submarine forests which have been discovered on several parts of the English coast; for example, in Lancashire, and in the Bristol Channel, near Bridgewater. In excavating the West India Docks, in the Isle of Dogs, near London, a complete stratum of decayed hazel trees was found: the wood and bark were quite soft and decayed, but the nuts were in tolerable preservation. Your aunt, I believe, has some specimens of them, which she will readily show you. The remains of the submarine forests of Lincolnshire were examined, not very long ago, by a gentleman who has published a paper on

the subject in the Philosophical Transactions; and if Caroline will fetch the volume for 1799, she and you may read his account.'

I shall make a few extracts from it here for Marianne's benefit.

This gentleman, having learned that there were several sunken islets along the coast where the remains of trees could be seen, took the opportunity of a very low tide to land on one of them near the village of Sutton; and he found that it was a mass of roots, trunks, branches, and leaves of trees, intermixed with aquatic plants. An immense number of the stumps were still standing on their roots, which, as well as the bark of the branches, appeared almost as fresh as if they had been just cut; and in the bark of the birch, even the thin silvery membranes of the outer skin were discernible. The wood, on the contrary, was decomposed and soft; but he understood that the people of the country had often found very sound pieces of birch and oak of which they could make use. He remarked, that the trunks and thick branches were flattened, as if they had lain under the pressure of a heavy weight; which is observable also in the *surturbrand*, or fossil wood of Iceland, and of the Feroe Islands. Above the matted branches, he found a thick bed of decayed leaves, which were scarcely distinguishable at first; but, after soaking a little in water, the

leaves of holly and of other indigenous trees were easily separated.

In a well that was digging in the neighbouring village of Sutton, a similar stratum of decayed wood and leaves had been cut through, at the depth of sixteen feet, and, therefore, very nearly at the same level with that of the islets; it extends through all the eastern parts of Lincolnshire, and has been traced as far as Peterborough, more than fifty miles to the south-west of Sutton. The fisherman informed him that islets of the same kind are found as far north as Grimsby, on the Humber; so that this great subterraneous forest was nearly eighty miles in length; and as there can be little doubt of the woody islets along the coast having been a continuation of it, the breadth must also have been considerable.

Dr. Correa de Serra, who wrote this account, says, that a most exact resemblance exists between maritime Flanders and the opposite low coast of England, both in elevation above the sea, and in the internal structure and arrangement of their soil. They contain similar organic remains of marine animals, as well as of tropical plants; and they each have a stratum of decayed trees and compressed vegetable matter, below the present level of the sea. He, therefore, concludes that the two countries were once continuous; and, instead of supposing that the

sea is now higher than formerly, he gives it as his opinion, that this part of the earth's surface has sunk below its ancient level. That the epoch at which this catastrophe took place must have been in a very remote age, he thinks may be proved from the sixteen feet bed of soil, which now covers the submerged forest; and because it appears, from historical records in the Academy of Brussels, that no change of that kind has happened in Flanders for more than two thousand years.

But the *uncovering* of the woody stratum in the Sutton islets, by the action of the sea, he refers to a comparatively recent date. The people have a tradition that their parish church once stood on the spot where those islets are now; and it is very probable that, before the skilful embankments were made which at present restrain the stormy inundations of the North Sea, the soil was gradually washed away by the waves, and the trees were thus left exposed.

When we had done reading the above, my uncle told us that he had himself visited the little hamlet of Sutton. The tides unfortunately were not low enough to expose the islets, or rather the sand-banks, which the Doctor mentions; but he saw a great number of the stumps and roots of the trees, which the country people had obtained at favourable opportunities. One fine oak stem had just been drawn on shore:

it measured forty feet in length, and five feet in circumference; and the wood, though rather soft on the outside, was sound within, though all black. He cut off a few chips with his knife, and was so good as to give me one of them. So, Mamma, if the stratum of earth which now covers this submarine forest was deposited there by the deluge, it is clear that the tree my uncle saw was antediluvian; and that the oak chip in my possession was of the same growth of timber as that of which the Ark was constructed.

16th, Sunday.—A question, that Wentworth asked, about the object and meaning of the prophecies contained in Deuteronomy, led to some observations of my uncle's, which I will endeavour to give you.

‘The prophecies of Moses increase in number and clearness towards the close of his writings. He appears to have discerned futurity with more exactness as he approached the end of his life. To be convinced of this, you have only to compare the records of history with his prediction of the successes as well as the dispersions and desolations of the Israelites; compare the rapid victories of the Romans, and the miseries sustained by his besieged countrymen, with his denunciations; and particularly compare his prophecies relative to the future condition of the Jewish nation, with their accomplishment

which is still going on under your own observation, and which, indeed, may be called a standing miracle.'

'But are we certain that some of these distant prophecies have not been added in later times?' Wentworth said.

'I am glad that you have made that inquiry,' replied my uncle; 'because it gives me an opportunity of showing you how impossible it is that any such addition could have been made to the Pentateuch. In the fourth chapter of Deuteronomy are these words: "Ye shall not add unto the word which I command you, neither shall ye diminish aught from it."'

'This prohibition preserved these books from the slightest alteration; for it was considered so binding, that no copies were allowed to be made by any persons but the Scribes attached to the synagogue; and as the Jews were commanded to read portions of them every Sabbath day in their families, and as at certain times the whole "law" was publicly read to the congregation, it is evident that any alteration must have been noticed. There is a remarkable proof of the fidelity with which that injunction was obeyed, in this fact,—that the Samaritans have preserved the law of Moses to this day, as uncorrupted as the Jews themselves have done; although they were irreconcilable enemies, and though they have been exposed to all the changes and revolutions that

can befall a nation during the long interval of two thousand four hundred years. No opportunity could have been more tempting than when the ten tribes separated from the house of David, and when each kingdom was zealously supported by a rival priesthood ; yet both parties religiously preserved the books of the law, without changing a letter.

‘ From the Christian era down to this day, the Jews, though dispersed into every country of the globe, continue to read the books of Moses and the Prophets every Sabbath day, in the original Hebrew ; and, however they may differ from us, or among themselves, in the *interpretation* of various expressions, they have always considered the strict preservation of the original *text* as the most important of their duties. Those books have now been translated into so many languages, and cited by so many authors, and have been the subject of so much discussion from the times of the Apostles, that it is absolutely impossible that any fraudulent change can have taken place since that period. I may add, that the books of the Old Testament were translated into Greek by the command of Ptolemy Philadelphus, about three centuries and a half before that period ; and they have therefore been, for upwards of two thousand years, in the hands of heathens and sceptics, who would have been eager to detect any alteration that might have been attempted.

‘ It is, indeed, a most striking circumstance, that notwithstanding the many corruptions which the Israelites fell into, while they had the sole custody of these books, no omissions should have been made in the copies, nor any attempts to suppress those parts of the law which bore directly on their misconduct ; and I think we may safely infer, that it was the will of him who had given the law, and who had inspired the prophecies, that they should remain an indestructible “ memorial to all generations.” ’

17th.—The more I learn from my uncle’s kind geological conversations, the more I see the necessity of acquiring some knowledge of mineralogy, in order to understand them. In the mean time, Caroline and I find even the general views he gives us so interesting, that we seldom miss an opportunity of leading him to the subject. This morning he told us, that the *debris* of the hills which accumulate in alluvial districts, usually continue in the loose form of gravel or sand, or mud, or clay, in which they were deposited. ‘ Their visible transformation,’ he said, ‘ into stone is of rare occurrence ; in some circumstances, however, especially on the sea coast, we may perceive the consolidation of the sand and gravel into thin strata. If a stream, impregnated with *oxide of iron*, should empty itself on the beach, it acts as a cement, and the pro-

cess goes on rapidly. The northern coast of Cornwall affords some examples of this sort of petrification at home; and abroad it may be seen on a much larger scale on the shores of Greece, Karamania, Sicily, and the West Indies. Abundance of sea shells and other organic remains are found in it; and at Guadaloupe a human skeleton was discovered in the beach, imbedded in a mass of that description.

‘ Some springs of water are so highly loaded with calcareous particles, that the sediment they deposit soon hardens into stone; and the *stalactites* which I shewed you are formed in a similar manner, in the caverns and fissures of all limestone countries. Those were very small specimens; but in some places, for instance, in the celebrated grotto of Antiparos, one of the Greek islands, they are found of enormous magnitude, forming rows and clusters of columns that reach from the top to the bottom of that great cavern. The water, in slowly dripping through the rock, becomes saturated with lime; as the drops exude from the crevices, or trickle down the stalactites already formed, they are exposed to the air; the watery part then evaporates, and the lime forms a hard stony crust, in some cases assuming the shape of small crystals.’

When we reached home, my uncle laid M. de Choiseul Gouffier's voyage on the table for us; and we all read with astonishment his descrip-

tion of that wonderful cavern, which is a thousand feet long, and full of these curious productions. The *stalagmites* that grow upwards from the floor, are equally curious. My uncle explained to us, that when the quantity of water that trickles through the roof is more than can be evaporated from the surface of the stalactite, the remainder falls on the floor, where the same process occurs; and thus the upper and lower concretions proceed, till they meet each other, and form an entire column. In the middle of the widest part of the cavern there is a stalagmite of twenty feet in diameter and twenty-four in height; and on this superb natural altar, another French nobleman had mass celebrated by his chaplain to more than five hundred people, who surrounded it. The cavern was lighted by a hundred large torches and four hundred lamps; and the splendour of this illumination, reflected by the concretions which hung from the roof, or which lined the sides, is described as producing a very magnificent effect.

18th.—It will not be my uncle's fault if I do not pick up some information in this delightful house, for every day he tells us something new. He has just been describing the method of casting plate-glass; and I hope some day to see the whole operation myself.

The furnace for melting the materials is about

eighteen feet long, and it is surrounded by ovens for *annealing* the plates of glass when made, that is, for cooling them slowly. The pots in which the materials are melted, are made of a sort of tough clay that is found at Stourbridge, in Worcestershire, as it has the property of standing the most intense heat; and they contain about twenty hundred weight of melted glass, or metal, as it is called by the workmen. The *cuvettes*, or cisterns, which convey the liquid glass to the casting table, are made of the same clay.

When the metal is sufficiently fluid, refined, and settled, which happens in about thirty-six hours, it is put, by means of ladles, into the cisterns, which are left in the furnace about six hours longer, till the little bubbles formed by this disturbance of the glass have all disappeared. The door of the furnace is now opened, and, by a chain, the cistern is drawn out upon an iron carriage, and conducted to the casting table. Here it is raised, by means of a crane, against two iron bars, which are so contrived as to incline the cistern, and empty the fiery torrent on the table.

This table is covered with a thick plate of copper, made very smooth on the surface; and it is supported on wheels, so that it can be moved from one annealing furnace to another. To regulate the thickness of the glass, two iron rulers are placed along the table, and on these rest the

extremes of a very heavy roller, or cylinder of copper, which, as it moves along, drives the superfluous matter before it, and renders the two faces of the glass parallel. The iron rulers being moveable, serve also to determine the width of the glass plate, and to prevent the matter from running over the sides; the waste metal falls into a trough of water at the end of the table, and is reserved for the next melting.

As soon as the glass has cooled to a proper consistence, it is examined; and if any bubbles or flaws are found, it is broken up and returned to the melting pot: but if it has a sound appearance, the table is rolled to the mouth of the annealing furnace, and the plate is carefully deposited there. The heat of this furnace is at first very great, but it is diminished every day for a fortnight, by which time the glass is sufficiently annealed. This process renders the glass less brittle; for if suddenly cooled, my uncle says, it would fly into pieces when touched.

19th.—Much as we were all interested by the manufacture of plate glass, my uncle steadily refused to carry us any further yesterday than the annealing furnace: this evening, therefore, as soon as we were comfortably collected round the fire, after dinner, we reminded him that he was to describe both the grinding and polishing operations; and the following is the substance of what he said.

The annealing furnace generally contains six plates of glass; when they are withdrawn, they are cut square by a large diamond, which moves in a wooden frame, and they are then carried to the grinding room. There each plate is laid on a table, covered with a large slate or flag; and, to keep the glass steady, it is bedded on the slate in wet plaster of Paris, which you know has the property of *setting*, or becoming hard, in a few minutes. A smaller plate of glass is then laid on the larger one, and being properly loaded and drawn forwards and backwards, and having a constant supply of fine sharp sand and water, the two glasses grind each other to a smooth, even surface. A ledge round the lower glass prevents the sand and water from running off; and the upper or moveable glass has a strong plank cemented to it, on which the weights are laid. An upright pin is fixed to this plank, to which a handle, like a coach wheel, is attached for the workmen to give motion to the glass, and much skill is required to vary this motion in every possible direction; for if they were frequently to repeat the same stroke, the glasses would grind each other into furrows. But no matter what pains are taken to vary this motion, the two surfaces have always a tendency to become slightly spherical, one convex and the other concave; and to prevent this, the upper glasses of the different grinding tables are occasionally changed,

so that two convex or two concave plates mutually correct each other.

When by these means a true surface has been obtained, finer sand is used, and then emery of increasing degrees of fineness, till the business of grinding is finished, and the plate is given to the polisher, whose operations my uncle was obliged to reserve for another evening.

20th.—Within the last few days the swallow has returned to us; I remember seeing it last autumn, but I did not notice it much.

I have observed that its motions are very rapid, and that it sometimes perches on the house, where it makes an odd little twittering noise.—It is a very pretty bird; the back and wings are black, glossed with purple; and the breast white, with a spot of dull red upon it. I have often read of swallows in poetry, and I shall be glad to watch this little summer guest, as it sports in the sunshine, or skims along the surface of the water. This species is, I find, the house or chimney swallow, and is distinguished from the rest of the tribe by a small white spot on each feather of the tail, which is more forked than any other species.

Mary tells me that these birds generally appear in England about the middle of April, though some few may be seen a little earlier; and that they remain to the end of September. Their

arrival, she says, is always considered to be the harbinger of summer, as they come here from warmer climates.

See from bright regions, borne on odorous gales,
The swallow, herald of the summer, sails.

There is a remarkable conformity, my uncle says, between the vegetation of certain plants, and the arrival of particular birds of passage. Linnæus remarked, that in Sweden the wood anemone blows on the arrival of the swallow, and the marsh marygold when the cuckoo sings; and a similar fact appears to have been observed in other countries also, for the same Greek word signifies both a cuckoo and a young fig, from their appearing at the same time.

These house swallows are the earliest of all the various species, as well as the most common. They build in barns, out-houses, and even in chimneys, the warmth of which they like; and they are said to pass with surprising address up and down the narrowest flues, to the depth of perhaps six feet, without soiling their wings.

All kinds of swallows, as they skim along the surface of the water, sip without stopping; but the common swallow only washes while on the wing; gliding through the pools many times together without seeming to stop.

21st.—After some little conversation about the alluvial alterations of the coast, and the

changes produced in the interior by the different causes which my uncle had already mentioned, he said to us this morning, ‘ Those alterations are so gradual, that years are required to detect their operations, or to measure the rate of their progress ; but the gigantic changes effected by volcanoes and earthquakes carry their desolation at once over whole districts. You have, no doubt, read an account of some of the destructive eruptions of Mount Vesuvius, by which, you know, the city of Herculaneum was overflowed with a torrent of melted lava, and Pompeii was buried, and remained concealed for many centuries under the ashes that were ejected from the crater.

‘ Large tracts of country seem to have been produced by volcanoes, and after the lapse of ages, the decomposed lava has become a fertile soil. But even within the reach of history, new volcanic mountains have been elevated, and new islands have sprung out of the ocean. Pliny and Seneca describe two marine volcanoes that raised themselves out of the water in the Grecian Archipelago ; and, in the beginning of the last century, the same thing again happened in the same place. In 1720, a small volcanic island rose out of the sea near Terceira, one of the Azores ; and in 1811, among the same group of islands, another violent eruption of lava produced an island of considerable altitude ; but in

the following year it sunk into the ocean. In the sixteenth century, the Lucrine Lake, near Naples, disappeared, and Monte Nuovo, a volcanic hill six hundred feet high, and four miles in circumference, rose out of the place it had occupied.

‘ Perhaps the most wonderful example I can give you of volcanic action, is the elevation of Mount Jorullo, near the city of Mexico, in 1759. Alarming sounds, and repeated earthquakes, which continued for three months, had prepared the inhabitants for some dreadful convulsion ; when at length a tract of ground, from three to four miles in extent, swelled up in the shape of a bladder, to the height of 500 feet. The terrified natives, who witnessed this extraordinary scene from the neighbouring mountains, asserted that flames burst from the ground ; that red-hot rocks were thrown to a prodigious height ; and that the surface of the earth was seen to heave like an agitated sea. The surrounding district is covered by hundreds of small cones, called *hornitos*, or ovens, by the inhabitants ; they are about ten feet high, and from each a thick smoke ascends. From among these ovens six large masses arose from the plain, some of them upwards of 1200 feet ; and the volcano of Jorullo, which has never ceased to burn, is now 1700 feet high. The place where this extraordinary convulsion took place, was forty leagues from

any volcano ; and what renders this remarkable is, that Jorullo appears to be in the exact line of continuation of a chain of distant volcanoes, as if there were a subterranean communication. Though the fire is now much less violent, and though the plain, and even the great volcano, begin to be covered with vegetation, yet Humboldt found the air dreadfully heated by the small ovens, and the thermometer rose to 202° on being plunged into the aqueous vapour emitted by every fissure in the ground.

‘ It is said that two rivers fall into the burning chasm, and that at some miles distance they emerge from the ground in a heated state. You may recollect Colonel Travers told you that he had seen the thermometer at 200° in a subterraneous spring called Nero’s baths, at Solfattera, near Naples ; and that he had eaten an egg which it had completely boiled in a few minutes.

‘ It is computed that there is at present nearly a thousand volcanoes known to exist, and yet there is no doubt that, in a former state of the globe, they must have been more numerous, and far more active and extensive in their operations. Remains of extinct volcanoes of great size are scattered in almost every country, and geologists are every day discovering large tracts of rocks and earths, which there is every reason to ascribe to volcanic agency.

‘ Several have been found in Europe, which

for many centuries must have been at rest. Great part of Italy and Sicily are clearly volcanic. Near Coblenz, in Germany, are the remains of several craters, and large masses of lava are seen strewed over the surrounding country. Along the Rhine, entire chains of volcanic hills are found ; and near Spa, there are traces of some very large volcanoes, with deep craters half full of water. Great part of Languedoc and Provence, in France, are volcanic ; and Auvergne presents an astonishing example of the activity of its ancient volcanoes, for the whole country consists of lava. In the East Indian islands there are great numbers ; Sumatra, Java, and the Molucca islands, possess some of the finest volcanoes now existing. You know, from Humboldt, how numerous they are on the western side of South America and Mexico ; and Nootka Sound, in the 50th degree of north latitude, was observed by Captain Cook to be entirely volcanic. In the Pacific Ocean, Easter Island is a mere mass of lava and basalt ; and I need scarcely mention the Sandwich Islands, as you have been lately so much interested by Mr. Ellis's account of the great volcano in Owhyhee, with its sublime gulf of boiling lava, seven or eight miles in circumference.'

23rd, Sunday.—My uncle continued the subject of the prophecies of Moses this morning.

‘ There are different kinds of prophecies in the books of Moses, some of which were fulfilled soon after the prediction—such as the conquest of the land of Canaan ; and others, the accomplishment of which was not to follow till after a long interval of time, such as those that relate to the coming of the Messiah, and the dispersion of the Jewish nation ; but in all there is the same clearness and consistency, the same tone of inspiration and authority, and the same internal proofs of their truth. The Jews have always looked on him as by far the greatest of all their prophets. They assert, that the others received the divine communications by dreams and visions ; whereas they were given to Moses by an immediate revelation from God.

‘ In the most important of all his prophecies—
“ The Lord thy God will raise up unto thee a prophet from the midst of thee, of thy brethren, like unto me ; unto him ye shall hearken ”—Moses does not say a priest or a king, though the Messiah was to be both ; but “ a prophet,” in order to put the people on their guard not to look for him among any of their priests or kings. They were not to expect a person clothed with the external honours of the throne, nor ranking high in the priestly form of their government ; but were to consider divine inspiration as the true test of that great prophet to whom they were to hearken, and who was to be the future head of their religion.

‘ In consequence of this prediction, an expectation of some extraordinary prophet had always prevailed among the Jews, and particularly about the time of our Saviour. They understood and applied it, as well as other similar prophecies, to the Messiah, who they admitted would be as great as Moses; but, forgetting the distinct explanation with which it was accompanied, they looked for pomp and splendour, instead of the quiet manifestation of divine power on suitable occasions; they looked for the worldly attributes of dominion, instead of the meekness and humility which had characterized Moses, and which entitled him to use the expression, “like unto me.”

‘ When our Saviour had fed five thousand men by a miracle like that of Moses, who fed the Israelites in the wilderness, then all those that were present exclaimed,—“ This of a truth is that prophet that should come into the world.” St. Peter and St. Stephen * declared to the people, that the prophecy directly applied to Jesus, for he fully answered the definition of a prophet like unto Moses. He was by birth a Jew of the middle class like Moses. He had immediate communication with the Deity, and to him God spake “ face to face,” as he had done to Moses. He was a lawgiver as well as Moses, and he performed “ signs and wonders”

* Acts iii. 22 ; vii. 37.

greater than those of Moses. "I will put words in thy mouth," God said to Moses; and our Saviour says, "I have not spoken of myself; but the Father which sent me, he gave me a commandment what I should say, and what I should speak."

'There is another circumstance to which I would call your attention. There are instances of kings, both Pagan and Jewish, who were described, long before their birth, by these holy men whom the Lord inspired; but we do not find that any prophet was ever foretold by an antecedent prophet; this pre-eminence was peculiar to the promised Deliverer.

'Several prophecies in the Old Testament plainly ascribe the destruction of the Jewish church and nation to their rejection of the Messiah. The words in Deuteronomy xviii. 19 are remarkably strong. "Whosoever will not hearken unto my words, which he shall speak in my name, I will require it of him." Daniel expressly assigns this as the cause of the destruction of their city and temple; and Zechariah describes the future repentance and mourning of the whole nation for their sin of "piercing," or crucifying Christ, as preparatory to their general restoration.

'And,' added my uncle as he finished, 'let us hope that the time is fast approaching, when,

instead of a wandering and despised people, we may see the whole Jewish nation repenting of their former obduracy, and yielding up their unbelief to a full, though tardy conviction.'

24th.—We claimed my uncle's promise this evening, of describing the mode of polishing glass. 'When the grinding operation,' said he, 'has been completed on both sides of the glass, it is again secured in plaster on a flat table, and the surface is rubbed with a block of wood covered with several folds of woollen cloth. The workmen supply the cloth with polishing powders, such as crocus, tripoli, and putty, beginning with the coarsest, and changing gradually to the finest.'

Wentworth observed that he had never seen putty in a powdered state.

'The putty of which you are thinking,' my uncle replied, 'is a mixture of chalk or whiting with linseed oil, for the use of glaziers; but the putty to which I alluded is the oxide of tin. Crocus is a preparation of the brown oxide of iron; and tripoli is a natural earth, which was formerly imported from Tripoli, in Africa, but is now found in other countries. Both the grinding and polishing of plate glass is performed in the large manufactories by the steam-engine.'

We begged of my uncle to describe to us the

process of silvering, so as to make looking-glasses. 'The coating a plate of polished glass with a thin pellicle of quicksilver, in order to give it the power of reflecting, is a very pretty and easy operation. I think Wentworth might readily perform it on a small piece of glass. Blotting paper is first spread on the table and sprinkled with powdered chalk; and over the paper is laid a sheet of tin foil—that is, tin beaten out in the same manner as gold leaf. On the tin foil quicksilver is poured and equally distributed, and cleaned from every speck by means of a hare's foot. Over that a sheet of thin smooth paper is to be spread: fan paper is the best; and on this paper the glass is placed. With the left hand you are to press down the glass, while with the right the paper is drawn out, and with it most of the superfluous quicksilver. The plate is then to be loaded with a great weight, to squeeze out more of the mercury; and, lastly, the glass is set nearly upright, that every particle that is not amalgamated with the tin may ooze out; for the thinner the coating of mercury, the more perfectly the metal adheres to the glass.'

If ever I should be in the neighbourhood of a plate-glass manufactory I will endeavour to see the whole process; in the mean time even the little knowledge one can pick up from a general description is better than entire ignorance.

Wentworth lost no time in making an experiment of the silvering operation. My uncle furnished him with tin foil and quicksilver; my aunt supplied paper, and a small rubber of cloth instead of the hare's foot; and we all assisted. There was a little bungling at first, but after a few trials we succeeded in making a scrap of looking-glass, which Wentworth intends to frame for Grace's doll.

'As glass was comparatively a late invention, uncle, what were the looking-glasses which are mentioned in Scripture?'

'The word,' said my uncle, 'should have been translated mirrors; they were formerly made of brass, or of a mixture of brass and silver, which takes a very high polish; and this inadvertence of the English translators is the more singular, because the context removes every difficulty. In the passage of Exodus* to which you refer, the laver is described to be made "of brass of the looking-glasses." Glass could not possibly have been converted into brass; but if the word be rendered by mirrors, the sense would be complete; that is, the laver and the foot of it were made of brazen mirrors.

'In Turkey, the common domestic mirrors at this day are made of brass; but I have heard that in Persia they are sometimes made of steel, and slightly convex. The metallic mirror, or

* Chap. xxxviii. 8.

speculum, which is now used in a reflecting telescope, is composed of about two parts of copper and one of tin; but what metals were employed by the ancients in their burning mirrors is not known.'

'You allude, I suppose, papa,' said Frederick, 'to the famous concave mirrors with which Archimedes destroyed the Roman fleet?'

'Long before his time,' my uncle replied, 'concave mirrors had been constructed, by which the sun's rays were so concentrated as to burn substances placed in the focus: but those used by Archimedes were not concave—they had plane or flat surfaces; and it was by the combination of a great number that the effect was produced. For you can readily conceive that whatever portion of the solar heat can be conveyed by reflection from a single plane surface, the effect will be doubled if the rays from another plane surface be directed to the same spot. Five or six times the direct heat of the sun would set dry wood on fire; but as more than half the heat is dissipated by reflection and by other causes, we may say that eighteen or twenty small plane mirrors would be quite sufficient for that purpose. The Count de Buffon tried a great many valuable experiments on this subject; with 154 mirrors he succeeded in burning wood at the distance of seventy yards, and in fusing several metals at eight, ten, and even twelve yards.

‘There was another circumstance in your question, Bertha, on which I must set you right. It is true that glass has been brought to great perfection by modern skill, but glass was known in the earliest ages of which any remains of art are now extant. The mummies, for instance, which have been brought home from Egypt, are ornamented with beads and bits of coloured glass. Pliny describes the manner of making it; and there are various authorities for believing that glass was even used in windows before the third century.’

25th.—The nightingale, the next bird that appears after the swallow, has arrived, and I have twice had the pleasure of hearing the sweetness, fulness, and power of its melody.

It is supposed to visit Asia during its absence from England, as it does not winter in the south of Europe or in Africa, but is found at all times in the East, from Persia to Japan. I must acknowledge that its song is more agreeable than that of the bird we call nightingale in Brazil.

The wry-neck and the cuckoo, which I have just heard, arrive here very soon after the nightingale. The wry-neck is a very pretty little bird; the neck and breast are of a reddish brown, and crossed with waving bars of fine black: it sits so very erect on a branch, that its body appears to bend almost backward, while it is constantly

turning its neck quite round from side to side ; and it also has the power of erecting the feathers of the head like a jay. I have seen it feeding on ants, which it dexterously transfixes with the sharp bony end of its tongue ; and the country people say, that the young ones, while in the nest, make a hissing sound like that of little snakes, which deters boys from plundering their nests.

There is something very cheerful in the notes of the cuckoo and the rail. They serve to mark one of the steps by which this changeful and busy season of spring steals on us with all its gradations of pleasure and interest ; and which, dear Mamma, I cannot help thinking preferable to the unvarying brilliancy of Brazil.

‘ Now Nature, soothed, assumes her wonted charms,
And, like an infant still’d, laughs through her tears
That glittering hang on every bloomy spray.
The birds their woodland minstrelsy renew,
In chorus universal ; while the sun
Gilds with effulgence sweet the azure vault,
And paints the landscape with a thousand flowers.’

I have seen the mole cricket to-day ; it is a most remarkable insect, endowed with wonderful strength, particularly in its fore legs, which are fitted for burrowing. The shanks are broad, and terminate obliquely in four large sharp claws, like fingers ; and the foot, which consists of three joints, and is armed at the extremity with two short claws, is placed inside the shank, so as to

resemble a thumb, and to perform its offices. The direction and motion of these hands enable the animal effectually to remove the earth when it burrows under ground ; and in wet and swampy situations, which it loves, it excavates very curious apartments.

There is the prettiest variety of wild flowers now in bloom all over our part of the forest ; not gaudy and dazzling, like the natives of the Brazil forests, but small and delicate, and beautifully marked and tinted. I am sorry to say the prim-roses are fading ; but wild violets, the wood anemone, and millions of cowslips with their pretty golden bells, make up for their loss.

I had almost forgotten to tell you that the buds and leaves of the branches I had in water have all withered away : ashamed, I suppose, to appear, now that there are abundance of real leaves.

27th.—My aunt has been extremely interested by an account she read of the progress of Christianity in the Sandwich Islands.

It is almost a singular instance of a nation by general consent destroying their idols, and being sensible of the insufficiency of their own religion. The small opposition made to the change, and the manner in which many of the chiefs publicly professed Christianity, give one every reason to hope that it will take root in the

minds of the people, and that the progress of Christianity and civilization will advance together. It appears to have been a spontaneous act of those intelligent and amiable islanders; and when the Blonde frigate arrived there in 1825, the new faith they had adopted had already materially purified their morals and improved their manners.

Besides wooden idols, the uninstructed natives had long worshipped the deities of their island at the foot of the stupendous mountain of Mouna Roa, imagining their favourite abode to be in the volcanoes it contained. Offerings were frequently made to court their favour; and at every fresh eruption of lava, hogs were thrown alive into those fiery gulfs, to appease the anger of Peli, the principal deity. To put an end to these superstitions, Kapiolani, the wife of a chief of high rank, who had recently embraced Christianity, determined to descend into the great crater, and, by thus braving the volcanic deities in their very home, she hoped to convince the people that they existed only in their imagination. A crowd of her friends and vassals accompanied her up the mountain, to the first precipice that bounds the sunken plain: there most of them stopped or turned back; and at the second, her remaining companions earnestly implored her to desist from her dangerous enterprise, which could

only serve to tempt the vengeance of the deities whose sanctuary she was about to violate. She proceeded, however, to the verge of the crater, and, being again assailed with their intreaties, she calmly replied, 'I am resolved to descend; and if I do not return safe, then continue to worship Peli; but, if I come back unhurt, you must learn to adore the God who created Peli.'

Few of her attendants had sufficient courage to follow this heroic woman; but she steadily persevered, and at length reaching the bottom of the dreadful chasm, she triumphantly thrust a stick into the burning lava, and for ever dissolved the spell of superstition which till that moment had bound the minds of the astonished spectators. Those who had expected to see the incensed goddess burst forth and destroy the daring intruder, were awe-struck; they instantly acknowledged the superiority of the God of Kapiolani; and from that time no reverence has been paid to the fires of Peli.

28th.—When I came down to the library early this morning, my uncle asked me several historical questions: taken thus by surprise, I should some months ago have been unable to answer, though, perhaps, I might have been acquainted with the facts; but now I conquered my difficulties in a tolerably satisfactory manner;

and my uncle congratulated me on the improvement of my memory, or rather of my recollection.

‘I believe, uncle, it is more from my not being quite so much frightened as I used to be at being examined; and besides, since I have been in this house, I have gained more knowledge.’

‘Yes, my dear, you have gained more knowledge; but of what avail would it be if your memory could not supply you with a key to it? You have materially improved your recollection; and I will tell you how: first, by increased *attention*, the foundation of all memory; and next by *exercise*, for every power of body and mind may be strengthened by constantly, though moderately, applying them to their proper purposes. You have also, I think, wisely aided your memory by some of the expedients that I formerly hinted to you.’

‘Do you mean, uncle, the classification of one’s knowledge, and the endeavour to connect detached ideas?’

‘Yes,’ said he; ‘I have carefully observed you, Bertha; and I perceive that you have in some degree acquired the faculty of catching the points by which ideas are related to each other, and thus of associating them in your mind with some one common principle. This is the true

way of strengthening the memory, and, indeed, at the same time, of improving the understanding. Every one who steadily pursues it will find, that the facility of this kind of arrangement increases every day, till at length it becomes so habitual as to be performed almost mechanically; that is, without the intervention of the will. The advantage is obvious: every new fact, every new idea becomes a catch-word to some other; and when referred to the common principle by which they are all combined, the mind rapidly and almost unconsciously runs through every link in the chain, and literally *recollects* those which may be wanted for the subject under consideration.'

'Do you not think, too,' said I, 'that as we increase our knowledge, those links become more numerous; and therefore, that the more new facts we learn, the more easily we can recollect the old ones?'

'In some measure,' he replied; 'but it is not merely by the new facts or ideas that we acquire, that our real increase of knowledge must be estimated; it is by the number of relations which they bear to those already in the mind. *New* knowledge does not merely consist in our having access to a new object, but in forming new combinations of the ideas which it excites with our former ideas of similar objects; it is not by loading

the memory with insulated facts, but by putting those facts in their right places, that we augment our stock of knowledge.'

'Indeed, my dear uncle, I feel the truth of that every day; for the more I know, the more my curiosity is excited, and I ramble on from one thing to another, till my head contains nothing but a confused heap of unconnected facts. Then, when I go back and try to put them in some sort of order, I find that the most useful circumstances are forgotten, and only those well remembered which happened to connect themselves with things long known.'

'That leads me,' said he, 'to another point, which I would earnestly press on your attention, — *discrimination* — or the selecting from the necessarily confused mass of new ideas which are constantly presenting themselves, those of the greatest importance. By grasping at all, you lose the real acquisitions within your reach; and though the sacrifice may at first appear great, you will be a gainer in the end. Every day your selection will be more judicious, and in time more abundant; and your knowledge of useful and connected truths will advance gradually and securely, because you will have learnt to hinge them properly together, without encumbering your mind with those that are insignificant.'

I then asked him if he approved of my writing

this journal, and whether he advised me to continue it ?

‘ Certainly I do, Bertha, because I am sure it is highly satisfactory to your mother, not only to know what you are doing, but to trace the progress of your mind. Besides, though I suspect that no young lady can write a great deal without introducing a little desultory matter, yet, from the pages you have occasionally shown me, I am sure there is much in your journal that may be advantageous to Marianne. Indeed I am glad you mentioned it, for I think it forms no bad illustration of the unconnected manner in which knowledge presents itself in every-day life ; and if our present conversation finds a place in it, tell your sister, from me, to attend to what I have said about discrimination, and to try her skill in selecting, and classifying in her memory, the many useful topics on which you have touched.

‘ The benefit to *yourself* of committing to paper the detailed knowledge that you acquire is quite another question. As a help to which the memory may refer, I am inclined to think that it is injurious ; except in so far as the time occupied in writing forces one to dwell sufficiently on the ideas, to perceive their analogy with others. But you may, I think, make a common-place book really useful, by stating your general impressions of the books you read,

and of the discussions you hear ; and by sometimes recording those passing thoughts which suggest themselves to every reflecting person. By thus frequently marking the state of your mind, you can hereafter judge of its progress ; and you will be able to correct the prejudices which may have impeded its steady improvement.'

29th.—I begged of my uncle to describe some more of the remarkable animals that have been found in a fossil state. He readily complied ; and as it is possible that I may one day have an opportunity of seeing some of these curious petrifications in the museums, I carefully noted what he told us.

' One of those huge oviparous quadrupeds to which the name Monitor has been given, was found at Maestricht, in soft limestone rock, mixed with flints. The skeleton was about twenty-four feet long ; the head four feet ; and, from the great breadth and strength of the tail, the animal is supposed to have inhabited the sea.

' There are but two living species of sloths known ; and two fossil animals have been found, which seem nearly allied to them. One of these animals, the megalonix, is of the size of an ox, and was first discovered in a limestone cave in Virginia. The other, the megatherium, is as large as a rhinoceros : its remains have been

found only in South America ; and it is a curious fact, that, greatly as these animals exceed the sloth and the ant-eater in size, they not only appear to belong to the same family, but their bones are found only in America, the very country inhabited by sloths and ant-eaters.

‘ The gigantic fossil elks of Ireland are also an extinct species : they are found under bogs, or in deep marl-pits ; and generally in an erect position, as if the herd had been suddenly overwhelmed by the mass in which they are imbedded, while it was in a fluid state. The distance between the tips of the horns of a skull, now in the museum of the Royal Society of Dublin, is eleven feet and ten inches ; and I have heard that a still larger specimen has been discovered in that country.

‘ The skull of the fossil ox, or buffalo of Siberia, cannot be identified with any of the known species of this animal ; and it is conjectured to have lived at the same time with the fossil elephant and rhinoceros, as it is found in the same alluvial tracts.

‘ Two distinct species of elephant are at present known—the African and the Asiatic ; but only one fossil species has hitherto been discovered, which has been called the mammoth—a name borrowed from the Russians. Though differing from both the existing species, principally in the structure of the teeth, it more

nearly resembles the Asiatic than the other. The remains of this animal have been found also in the alluvial soil around London, and in a great many parts of England, and even in this county. In Ireland also, in Sweden and Norway, and in almost every country of Europe, they have been discovered. Humboldt found their teeth in South America; the North American naturalists have also found them; and lately, Lieutenant Kotzebue, the Russian navigator, perceived them in an *iceberg* near Behring's Straits. But it is in Asiatic Russia that they occur in the greatest abundance: there is scarcely a river there with alluvial banks, that does not afford remains of the mammoth, and generally accompanied by marine shells.'

My uncle then was so good as to go to the library for an account of a fossil elephant that was found in a state of perfect preservation, though its great antiquity is evident, from the whole race to which it had belonged being now extinct. The account was drawn up by the celebrated M. Cuvier, from observations made on the spot by Mr. Adams.

'In the year 1799, a portion of an ice-bank, near the mouth of the river Lena, in the north of Siberia, having fallen down, a Tungusian fisherman perceived a strange shapeless mass projecting from the remaining cliff of ice, but at a height far beyond his reach. The next year

it was a little more exposed, by the dissolving of the ice ; and, in the end of the summer of 1801, he could distinctly see that it was the frozen carcass of some enormous animal. He continued to watch it till the year 1804, when the ice having melted earlier, and to a greater degree than usual, the carcass became entirely disengaged, and fell down from the ice-cliff on an accessible part of the shore. The fisherman carried away both the tusks ; and so well had the ice preserved the ivory, that he sold them for fifty roubles. This circumstance having come to the knowledge of Mr. Adams in 1806, he travelled to the spot to examine the animal, but he found the body greatly mutilated ; much of the flesh had been taken away by the natives to feed their dogs, and one of the fore legs had been carried off, probably by the white bears. The rest of the skeleton was entire ; the head was uninjured—even the pupil of the eye was still distinguishable ; and the ears were well covered with bristly hair. A large quantity of the skin remained, which was extremely thick and heavy ; and there was a long black mane on the neck, the stiff bristles of which were more than a foot in length.

‘ About thirty pounds weight of reddish-brown bristly hair was collected in the mud, into which it had been trampled by the bears while devouring the carcass, as well as a quantity of

coarse wool of the same colour. The wool was evidently the same kind of covering that lies next the skin of all the inhabitants of cold climates; and this very interesting fact proves that the fossil elephants of Siberia were residents of that country, and that they belonged to a race which no longer exists, which was fitted by nature for a rigorous climate, and which could not have endured the sultry regions where those animals are at present found, and where their skin is nearly bare.'

My uncle added that it was impossible to conjecture at what period this elephant had been buried in the ice, but that it was evident he had been frozen at the moment of his death, which sufficiently accounts for the preservation of the flesh. In cold countries it is common to preserve meat through the longest winter by freezing it; and all kinds of provision are sent at that season from the most remote of the northern provinces to St. Petersburg.

Gmelin, a German traveller, tried how deep the ground had been thawed by the heat of a whole summer at Jakutsk, in 62° north latitude: he found it soft to the depth of two feet and a half; there it became harder; and at half a foot lower, it scarcely yielded to the spade. The inhabitants of that place keep their provisions continually frozen in caves which are only six feet below the surface.

30th, Sunday.—I asked my uncle to-day to explain to me the nature of those three feasts at which all the Israelites were enjoined to attend in the course of the year; the feast of Unleavened Bread; the feast of Weeks; and the feast of Tabernacles*.

‘Feasts,’ he replied, ‘were appointed to commemorate those great events with which the existence of the Israelites, as a separate people, was identified; they also afforded opportunities of giving general instruction, of expounding the law, and of keeping up a useful connexion between the distant tribes, by meeting each other at stated times in the holy city. The first and most ancient of feasts, you know, was the Sabbath, a day of general rest, in memory of the Creation; and there was also a Sabbatical year of rest every seven years; and a jubilee year every seven times seven years. The feast of Atonement took place in the seventh month; the feast of Trumpets celebrated the first day of the year; and in after times feasts were instituted on the restoration of the Temple, and on the deliverance of the Jews from Haman’s plot.

‘But of all the annual festivals, the three about which you inquire were the most sacred and important. The feast of Unleavened Bread was only another name for the feast of the Passover. It lasted seven days after the Paschal

* Deuteronomy xvi. 16.

lamb had been killed ; sacrifices were offered on each of the days ; no bread but such as was unleavened was permitted to be eaten during its continuance ; and the first and the last days were observed with peculiar and impressive ceremonies. The departure of the Israelites from Egypt, and the wonderful acts of Divine power by which their liberation had been accomplished, were the objects commemorated at this great assemblage of the people ; but we have so often conversed on the Passover, that I need not renew that subject now.

‘ The Feast of Weeks,’ my uncle continued, ‘ was so called, because it was kept at the end of seven weeks, or a *week of weeks*, after the Passover, that is, on the fiftieth day ; and therefore it has been also called the Feast of Pentecost, from a Greek word signifying fiftieth. It lasted seven days, and was held in remembrance of the law which was given to the people, at Mount Sinai, on the fiftieth day after their leaving Egypt. At this feast, two loaves of bread and a certain quantity of meal, to represent the first-fruits of the ground, were offered as a solemn and grateful acknowledgment for the harvest, which, in that fine climate and fertile country, had already commenced. The modern Jews keep this festival with great strictness ; but they mix various traditional rites with the ceremonies. In this country, I understand

that they decorate their houses with garlands of flowers, and strew roses in the synagogues ; and, in Germany, each Jewish family has a high rough cake, to represent Mount Sinai, composed of seven layers of paste, to designate the seven heavens through which they pretend that Jehovah descended to declare the law to Moses. As the Passover was the type of the sacrament of the Lord's Supper, so the Feast of Weeks was the type of our Christian Pentecost, which took place fifty days after the resurrection, and on which the astonishing miracle was performed, of the gift of tongues to the apostles.

‘ The Feast of Tabernacles was established in the middle of the seventh month of the ecclesiastical year, or in the first month of the civil year, which began in September. All Israel were obliged to assemble in order to celebrate this feast, and to live in tents or booths made of green boughs, during its continuance. The same word in Hebrew signifies both ~~tabernacles~~ and tents, and this great religious festival was held in memory of the journey through the wilderness, and of the mode in which their forefathers had dwelt there in tents, during forty years. On the first day, the people, with branches of palm trees, willows, and myrtles in their right hands, and a citron bough, bearing its fruit, in the left, joined in procession round the altar, waving the branches, and singing Hosannas.

The six following days burnt offerings were made, and the latest fruits of the year were presented at the temple ; on the eighth and last day, the procession with branches was repeated, with still greater solemnity, and the whole feast concluded with what was called the Hosanna Rabbah, or the great Hosanna. This word literally means " Save, I beseech thee ;" it was a common form of religious blessing or salutation ; and thus, to that ancient mode of solemnizing the feast of tabernacles you may trace the branches that were cut down, and the acclamations of " Hosanna to the Son of David !" with which our Saviour was received on his public entry into Jerusalem.'

May 1st.—This has been a day of amusement ; and the Miss Maudes and their brother, who came here yesterday, have greatly added to our gaiety. Very early this morning we all went out, not exactly to gather May-dew, but to see the numbers of people that went out Maying. Several Mæy-poles and garlands had been erected ; but we were most interested by that which the little school-children had dressed up opposite to their house. They had also placed an arch of flowers and hawthorn branches over the door ; with a magnificent C in the middle of it, made of daisy-flowers strung on thread.

This was in compliment to Caroline, and,

when she passed under it, they all joined in chorus, singing these lines of their own composition :—

We'll welcome Miss Caroline with flowers so gay,
To the school where she teaches us goodness and truth ;
Oh ! may she be happy on ev'ry May-day,
And most graciously pardon the follies of youth.

My uncle says it has been always the custom to celebrate May-day in this county, and that to have a pretty May-bush is still considered quite important.

In Huntingdonshire, Miss Maude told us that the children hang every place with garlands, and sometimes they make very pretty triumphal arches. To a horizontal hoop, two semi-hoops are fixed, so as to form a sort of crown, which is ornamented with flowers, ribbons, necklaces, spoons, and all kinds of finery. This is suspended across the road by a flowery rope, extending from house to house, while the children sing, dance, toss their balls over it, and ask money from the passengers. Miss Maude repeated to us their usual song.

The May-day Garland.

'To the lilac, laburnum, and iris, which cheer,
The hawthorn, the cowslip, and king-cob so gay,
Each beauty which gladdens the spring of the year,
And the kerchiefs and ribbons our friends have supplied,
In bows and in streamers are tastefully tied,
And form our sweet garland, our garland of May.

'Beneath it we'll dance, and we'll throw up the ball,
And all shall be gladness, good-humour, and play,
We'll sing, and in chorus we'll join one and all,
And glad as the season, we'll lift up our voice,
And all, within measure and reason, rejoice
Beneath the gay garland, the garland of May.'

My uncle observed, that in Cornwall, where customs have been less changed than in most parts of England, the May-day ceremonies are kept up with great care. He learned from a friend, who lived in a remote town in that county, that all the houses were thrown open; lively music was everywhere heard, and the young maidens, decked with wreaths and festoons of flowers, danced along the streets, and in and out of the houses, which all lay open to receive these merry groups.

'The annual celebration of this day,' he continued, 'may be traced up to a very high antiquity. The Romans had their Floralia, or games in honour of Flora, during the calends of May; and in Asia, when the sun entered the constellation of Taurus, which corresponded to that period, the same kind of festivities took place, accompanied by a similar display of flowers. Some antiquaries have shown, that May-day was celebrated in this country long before the Roman invasion, and they ascribe the introduction of the custom to an Asiatic colony that settled here, and who, of course, brought with them their national habits. In the East, cus

toms have undergone but little change; and many of the sports which are prevalent on May-day, in some parts of England and Ireland, and which, at first sight, appeared to proceed from unmeaning caprice, may be proved to be fragments of ancient Eastern ceremonies, by their similarity to those still practised there on that day.'

My aunt said, that she had seen a May-bush very prettily hung with flowers at Chamouni, in Switzerland; and she added, 'in the old-fashioned custom too of making fools on the first of April, there is probably a vestige of the Eastern celebration of the season when the sun enters Aries; that is, when the year commences. In Persia, medals of gold were struck with the head of the Ram, on the festival of the Nauruz, or new year's day; and the frolic of making fools still distinguishes the Nauruz festival, and is practised, I believe, from one end of India to the other.'

I asked my uncle when that Eastern colony to which he had alluded came to England, as I did not recollect seeing it mentioned in the History of England.

'The ancient Britons,' said my uncle, 'had a tradition of their being descended from an Eastern tribe called Sacca; and, undoubtedly, there are many points of resemblance between their modes of worship, and those practised in

some of the Indian provinces. It would probably be tiresome to a young person like you, Bertha, to read all the arguments on this disputed point; but hereafter you may find it a subject of curious inquiry, to examine the coincidences said to exist in the manners of such remote nations of the East and the West.'

3rd.—I have such a severe cold, that, fine as the weather is, I am not allowed to go out; so I can write without interruption to my dear Mamma. I must confess my own foolish imprudence was the cause of this cold: on the evening of May-day, my aunt allowed the school-children to have a dance on the green, and we all joined in it round their pretty May-bush. I exerted myself so much, that I was soon overheated; and then stood in the wind to cool myself. My aunt warned me of the consequence, but I was too much diverted to attend immediately to her advice, and the next morning I had a violent head-ache, and all the symptoms of a heavy cold. However, as my uncle had arranged everything for showing a cloth manufactory, several miles from this, to the Maudes and Miss Perceval, I could not bear to give up what I might not have another opportunity of seeing. Besides, we were to cross the river at the ferry, where horses had been ordered to meet us; and I hoped to see a great deal of

new country. My friends, indeed, advised me to remain in bed, but I would not acknowledge how ill I was ; and persisted in accompanying them. Of course my head grew very painful, and my cold oppressed and stupified me so much, as to prevent my remembering distinctly the half of what I saw.

I recollect, however, being shown how the wool was washed and beaten, in order to clean it. When well dried and picked, it was *carded* on large cylindrical brushes, made of wire instead of hair, which laid all the fibres in one direction ; the wool was then oiled, and again combed or brushed with finer cards on the knee, and at last spun into yarn—that intended for the *warp* being always smaller and more twisted than that of the *woof*. The yarn for the woof was then wound on little *bobbins* or tubes ; and in weaving, one of these is placed in the middle of the *shuttle*, on a pin, round which it easily turns, so as to let the thread run off through a hole called the *eye* of the shuttle, as it travels from side to side of the loom.

I will not tease you with the manner of warping the yarn from one *beam* to the other ; nor with a description of the *heddles*, or looped strings, which raise and depress the alternate threads of the warp for the shuttle to pass between them, and which the weaver works by his feet ; nor of the *batten* and *reed* for driving

the woof home every time the shuttle carries it across; all these appeared very simple, while looking at the operation, but I am afraid that I should give but a very lame account of them. Still less can I attempt to describe a power-loom which has been just set up; it seems to do every thing without the interference of the weaver—the heddles rise and fall, the batten strikes in regular time and with equal force, and the shuttle flies to and fro from selvage to selvage as if it was alive.

At another loom they were taking off the cloth from the beam on which it had been rolled in the process of weaving, and many hands were immediately employed with iron nippers in trimming and cutting off the knots and threads. The obliging proprietor of the manufactory partly described and partly showed us the subsequent operations of scouring the cloth with potter's clay, steeping and *fulling* it, and then stretching it lengthwise to take out the wrinkles. This is repeated several times, then it is washed in clear water, and given wet to other workmen to raise the nap, by means of a flower called *teasel*, which somewhat resembles a thistle. When the nap is well raised on the right side, it is given to the shearers, and then to the dyer; and when dyed it is again washed in plain water, and spread on a table, where the nap is laid properly with a brush. It is then hung up to dry, and stretched

in every direction ; after which it is folded and laid under a press.

It seemed very curious to see a homely wild plant like the teasel, fresh from the field, used along with so much complex machinery: many imitations of it have been tried, but nothing answers so well as the beautiful little hooks contrived by nature. In the west of England, therefore, wherever the soil is dry and gravelly, teasels are cultivated on a large scale for the cloth manufactories.

I remember little more of what I saw or heard yesterday, except that my uncle remarked as we passed a sheep-walk in our drive home, what an astonishing number of people combine their labours to produce any one manufacture, and how necessary the different trades are to each other. From the grazier, for instance, who rears the sheep and sells the wool, and the various artificers employed in preparing, spinning, weaving, dyeing, and pressing it, up to the retail shop-keeper who keeps the cloth ready for our use. ' But in fact,' said he, ' these are only a few links of the chain ; we must recollect the numerous hands employed in making the machinery, the miner who raises the iron ore, the smelter who converts it into metal, the smith who works it, and the collier who supplies them with coals ; the carpenter who constructs the frame-work, and the engineer who contrives the whole. Then

come the merchants, and shipwrights, and sailors who bring home from distant countries the articles requisite to colour the cloth, and the dyer, who, by the aid of chemistry, compounds them ; and lastly, the farmer who cultivates the humble teasels. See, Bertha, what a prodigious number of heads and hands are thus toiling for the accomplishment of a single object, and, though all impelled by individual interest, yet all co-operating for the general good.'

4th.—As I am still paying for my imprudence, and confined to my room, kind Mary has been entertaining me with the conversation she had heard below stairs, and particularly with Mr. Maude's account of Venice. Nothing in Italy so much struck his imagination, as the view of that city, with all her towers and pinnacles rising from the sea, where, the poet said,

' Venice sits in state, throned on her hundred isles !'

But now it has a most melancholy appearance : the port, which in times of prosperity was crowded with shipping, is now almost empty ; and the muddy canals which intersect the town in every direction are no longer enlivened by multitudes of gondolas gliding swiftly through the water. The showy palaces which rise from the sides of these watery streets, were once adorned with all that painting and sculpture could perform ; but

they are now neglected, moss-grown, the habitations of owls and bats, and fast sinking to decay : and many of the great families who had inherited their wealth and honours in direct succession for a thousand years, are now obliged to part with their splendid mansions, or to see them gradually crumbling into ruins, from the want of means to repair them.

Notwithstanding all this, Mr. Maude says that Venice is still a magnificent-looking place ; and amongst its many beautiful buildings, he describes the cathedral as being most venerable and interesting. It was built so long ago as the ninth century, and enriched with the spoils of Greece and of Constantinople. He once went through the city at night, to see the effect of moonlight on its superb buildings ; but the few of them which were still dazzling with lamps, as if enjoying their former glory, made such a contrast with the pale light and dark shade of the moon, and with the general stillness, that the whole scene had even a more deserted appearance than in the day-time. Now and then the gloomy silence was interrupted by the sounds of the harp or guitar, or by the wild and plaintive airs of a few gondoliers, as they kept time to the gentle splashing of their oars.

Mr. Maude, she says, added a great deal about the present government, the state of

society, and the remaining commerce of Venice ; and my uncle, who was much pleased with his observations, remarked that few of the changes recorded in history, offered a subject of deeper interest, than the long-continued grandeur and present fall of Venice. ‘ It rose,’ he said, ‘ as it were, from the waves, when, on the invasion of Italy, by the Huns, numbers of people took refuge in that cluster of islands where the city now stands. So early as the year 421, they formed a little state, strong enough to oppose the invaders, or at least to secure themselves from molestation. Commerce soon followed security ; and from this small beginning arose that wealth and power which continued for many centuries, and which extended the influence of Venice over all the states with which she was connected. Her foundations were laid in the darkest ages of Italian misery ; but she soon became the spectator of the dissolution of the Roman Empire. She witnessed the ravages of many continental wars, and the rise and fall of many nations ; till at length she fell in her turn also. Somebody has well remarked, that she was the last surviving witness of antiquity, the common link between the two periods of civilization.

‘ Her whole history,’ continued my uncle, ‘ has a paradoxical and peculiar character. Her romantic achievements in the East ; the noble

lead she took in the struggles of Christendom with the empire of the Turks; and the heroic defence she made against the attacks of numerous enemies, place her resources and power in singular contrast with the smallness of her territory. On the other hand, her selfish policy, her imperious conduct wherever her influence extended; and her deadly jealousy of the neighbouring republic of Genoa, rendered her the object of universal envy and hatred. While at home the rigorous despotism of her government, which was ill-concealed under the mask of republican freedom, and the inquisitorial tyranny of the senate, which silently pervaded every house, and controlled almost the thoughts of every individual, could tend only to alienate her subjects. These are points of deep moral and historical interest; but it may be safely said that her government outlived the age to which it was suited; no timely reform adapted it to the growing changes in the public mind—no concessions to the people united them in common cause with their haughty masters—and the fall of Venice may be ascribed more to her internal vices, than to the overpowering armies of France.'

5th.—I have been so much better all day, that I was allowed to go down to tea; and had the pleasure of hearing Mr. Maude describe the

fruitières in Switzerland. I quite misunderstood that word at first; for I find that it means a kind of dairy, something like that described to us by our Savoyard friends last winter. The person by whom the *fruitière* is managed receives their milk daily from all the neighbouring peasants; he sells the cream, and butter, and makes the cheese; and at the end of the season pays the contributors either in cheeses or money. He keeps an exact account, not only of the quantity of milk brought in, but, to prevent fraud, such as mixing it with water, he ascertains its quality by a kind of *hydrometer*, or floating gauge. Persons detected in cheating are struck out of the book, and lose what they had already contributed. The *fruitière* man who manages the business and keeps the accounts, is paid by a small per centage on each cheese.

This plan is chiefly adopted in those parts of the country where the cattle are taken in summer to pasture in the mountains; the farmers confide their cows to a man who lives in a chalet, such as Madeleine mentioned, and spends night and day in milking the cows, and in making and turning the cheeses.

The same practice has been introduced into Piedmont and Lombardy. All the dairies in which the Parmesan cheeses are made are supplied in this manner. The meadows of Lombardy, in the vicinity of the Po, are the most

fertile in the world : being constantly watered, they produce three or four crops of hay in the season ; but as they are occupied by a great number of individuals, there are few who can support a dairy, because the making cheeses requires a large quantity of milk, the produce of at least fifty cows. To effect this, the Lombards have formed societies in order to make their cheese in common ; and twice a day the milk is sent to the principal house, where the dairy-man keeps an account of each person's share.

This subject reminds me that my aunt has had a satisfactory letter from Bertram and Madeleine. He is much improved in strength. She appears to be very happy, and the little girl is going on well.

7th, Sunday.—Wentworth has been so much interested by the character of Moses, and by the explanations my uncle has occasionally given of his prophecies, that during the last week he prepared a long string of questions for this morning. His father was pleased by this eagerness to obtain information, and answered them all most kindly and fully. I need not repeat the questions, I shall only tell you the general substance of the answers ; and you, dear mamma, who are so well acquainted with the subject will easily trace my omissions.

The prophecies of Moses may be considered

in some measure as supplemental to those of Jacob and Balaam. He enters into many details of the perverseness and the corruptions of the Israelites, and the consequent calamities of famine, pestilence, and war, which should afflict them under the government of their kings. He states them almost with the simplicity of an historical narrative; while all other prophecies, except those of our Lord, are expressed in more poetical and in far more obscure language.

The 28th chapter of Deuteronomy contains several passages which are plainly indicative of the captivity of the ten tribes by the Assyrians, and of the two remaining tribes of Judah and Benjamin, by the Babylonians. In examining the books of Kings and Chronicles, we find that most part of those predicted judgments were fulfilled in the order he foretold; as in the dearths that took place, the plagues that carried off numbers of the people, and the repeated invasions of the country by the Moabites and Philistines, and afterwards by the Ammonites, Chaldees, and Syrians. The captivity of Jehoiachin by the Babylonians was a striking accomplishment of the prophetic threat in the 36th verse. 'The Lord shall bring thee and thy king which thou shalt set over thee, unto a nation which neither thou nor thy fathers have known;' for it was delivered long anterior to the establishment of any king. The conclusion

of that verse, 'and there thou shalt serve other gods, wood and stone,' was also precisely fulfilled, as the people were compelled by their cruel conqueror to worship his idols.

The circumstantial prophecy contained in the last twenty verses of that chapter, was fulfilled most literally by the invasion of the Romans, the destruction of Jerusalem, and the complete dispersion of the Jews. The Romans were described in it with characteristic precision, eight hundred years before they existed as a nation. It is said that they were to come 'from far, from the end of the earth : ' now the western parts of Europe were, at that time, the limits of the known world ; and it is remarkable, that the armies of Titus and Adrian were principally composed of Gauls and Spaniards. The rapidity of the Roman marches is compared by the prophet to the flight of the ' eagle, ' and it is not too much to suppose, that in that expression he alludes also to the eagles which were the Roman ensigns. Their language was not to be understood by the Jews ; and the ' fierce countenance, ' for which the Romans were distinguished from the earliest periods of the republic, is noticed, as well as the merciless ferocity of their conduct.

The horrors of the siege of Jerusalem are next foretold with dreadful exactness ; as well as the miseries the people were to endure in their sub-

sequent dispersion. 'The Lord shall scatter thee among all people, from the one end of the earth even unto the other; . . . and among these nations thou shalt find no ease, neither shall the sole of thy foot have rest.' 'Observe now,' said my uncle, 'the fulfilment of that prophecy. Since their calamitous expulsion, the Jews have wandered over the face of the globe for one thousand seven hundred years, without national possessions, government, or laws. Their riches have exposed them to plunder, and their poverty to contempt. Driven from place to place, they have been persecuted, even in Christian countries, with unrelenting cruelty; they seem to have lost their rank in the creation, and have been made to feel the "trembling heart," "the sorrow of mind," and the uncertainty of their lives, of which their great prophet so emphatically warned them.

'Yet, notwithstanding their sufferings, they have been preserved a distinct people through all the changes of nations; for the same prophet said, they should 'only be oppressed and crushed;' not exterminated and rooted out like the Canaanites. They have adhered to their religion, and retained the sacred language of the Scriptures; they appear to have been preserved for "a sign," and for "a wonder;" and they may be said to be the depositaries of the pro-

phacies,* the continued accomplishment of which is really a standing miracle of the most extraordinary and convincing nature.'

I am ashamed, dear Mamma, of the slight sketch I have given of what my uncle said at great length in answer to Wentworth; but, though I have done him very little justice, it has all made a deep impression on my mind, and I am going to read a book he has lent me on the comparison of the prophecies with profane history.

Stth.—At last I have escaped from confinement, and am enjoying the delight of fresh air. Everything looks gay; the sweet flowers, the bright green shrubs, the butterflies flitting about in the sun-beams, and, above all, the unceasing singing of the birds. Oh, Mamma, how can you bear to live where you hear so few warbling birds?

The change that one short week has produced in my garden is quite magical; it is really a sheet of flowers; and I found there a new proof of the goodnature of my cousins, for they had pulled up every weed that disfigured it while I was confined to the house.

In my aunt's garden there is a tree of the Yulan Magnolia just opening its large tulip-shaped blossoms, which are so fragrant, and of so pure a white. It is nearly twenty feet high,

and it is so hardy, that she wonders this beautiful shrub is not more common in all gardens.

What a peculiar character the hawthorn gives the hedges in this country ! It is called *May*, and indeed it is so pretty, that I think it deserves that honour.

‘ For thee, sweet month, the groves green liveries wear,
If not the first, the fairest of the year ;
For thee the Graces lead the dancing Hours,
And Nature’s ready pencil paints the flowers.’

I have been examining with my aunt the tendrils of the sweet pea ; they are so generally found just in the right places for attaching themselves to some convenient support, that one would almost imagine they knew exactly where to put out ; but she pointed out some that were idle and useless. She then showed me the beautiful arrangement of nature by which the honeysuckle supports itself : when a straight shoot becomes long and weak, it curls into a spiral figure, which gives it great additional strength, even if alone, and enables it to take a firm grasp of any twig that it meets. But if two or more shoots should touch, they immediately twine or screw themselves round each other, like the strands of a rope, for mutual support.

Another fact my aunt told me on this subject is, that the clasps of briony always shoot forward in a spiral, in search of support ; but if they meet with nothing, after completing a spiral

of about three turns, they alter their course, and proceed in some other direction.

9th.—Caroline and I had a nice walk this morning with my uncle, and I hasten to write down the additional facts that we learned from him on the subject of fossil remains.

Shells, he told us, are generally found entire, and the skeletons of fishes are frequently discovered in such a perfect state, that both their families and species can be easily ascertained. But the fossil remains of quadrupeds are very rarely complete; some of the parts are wanting; the bones are either scattered at a distance from each other, or else lying confused together, and generally broken. Yet these misplaced fragments are the only means left for naturalists to determine the species of the animal to which they had belonged; and in frequent cases a single bone has been sufficient for that purpose. This is effected by the science of *Comparative Anatomy*, or, in other words, a comparison of the construction and the functions of the corresponding parts of the inferior animals, with those which belong to the human body; and perhaps no science furnishes more instances of ingenious observation and beautiful reasoning.

Every organized being forms an entire system

of its own ; all its parts have a mutual relation to each other ; and each of them, taken separately, will, therefore, clearly point out the other parts to which it must have belonged. Suppose a ploughman turns up in a field a few bones—the only conclusion he can draw is, that some unknown animal had died near that spot ; but the comparative anatomist can tell the size of the whole animal, its general form, the structure of its jaws and teeth, and, consequently, whether it belonged to the herbivorous or carnivorous tribes. None of these separate parts can vary their forms without a corresponding variation in the other parts of the animal ; and, consequently, each of those parts, taken separately, indicates all the others to which it had belonged.

If the stomach of an animal is organized so as to digest only flesh, then the jaws and the incisive teeth must be constructed for devouring flesh ; the claws for seizing the prey ; and the entire system of the limbs for pursuing and catching it. Every one of those organs is indispensable in the structure of carnivorous animals ; so that by the bones of the paw, or the arm, or the shoulder-blade, or the leg, the construction and disposition of all the rest may be determined ; and, consequently, the whole form, species, genus, and class of animal must necessarily be discovered by the examination of a single bone.

The hoofed animals, it is plain, must be herbivorous, because they are possessed of no means of seizing their prey ; it is also evident that their fore-legs, being only necessary to support their bodies and to assist their progressive movement, they have no occasion for any rotary motion in that joint that corresponds to the human wrist ; and their food being herbaceous, their teeth must have flat surfaces ; but at the same time, in order to bruise seeds and tough plants, the teeth are composed of alternate layers of hard enamel and soft bone ; and a horizontal or grinding motion is given to the lower jaw, which for that purpose has a peculiar conformation of its joint. Again, we know that ruminating animals alone are provided with cloven hoofs, so that, from a simple foot-mark, we can be perfectly certain that the animal possessed such and such teeth, jaws, legs, shoulders, and horns ; and that it fed on herbage.

The same laws and the same modes of reasoning, of course, equally apply to petrified bones, and in this manner seventy-eight different fossil quadrupeds have been ascertained and classed, of which forty-nine are of extinct species. It is remarkable, that oviparous quadrupeds are generally found in more ancient strata than the viviparous tribes. A few bones of marine animals, such as seals, are found in the shell lime-

stone which immediately covers the chalk strata, but no bones of land quadrupeds have been discovered in that formation; they generally occupy the ancient alluvial beds composed of sand and pebbles which lie over the limestone.

Some species, which, though now extinct, belonged to families that still exist, have been found among the remains of the more ancient and unknown genera; but none of the animals which at present inhabit the earth are ever found, except on the sides of rivers, or at the bottom of marshes, or in the superficial formations; and though their deposition has been comparatively recent, their remains are always the worst preserved.

10th.—The plants which I placed in baskets in the pond have flourished so greatly, that I want to try the same plan with other plants of the same nature: my uncle laughs at me, and says I would put the whole contents of the conservatory into my pond; but indeed I only want to try a crinum, a pancratium, and one or two others. However, I shall confine my wishes now to an agapanthus, or African lily, because my aunt thinks that we shall be in Ireland at the flowering time of the others, and that I should not witness the success of my experiment. I have re-potted the agapanthus in a rich sandy compost, but I have only put the fibrous part

into the earth : the whole of the tuber remains above ground. This is to be plunged to the rim in the pond, and the gardener has directions to watch its progress, if I should not be here.

Mary has had some plants of the lobelia fulgens in the conservatory for some time ; they were planted in good strong loam, and the pots stand in saucers continually supplied with water ; they have already grown amazingly, and will, I am sure, be five feet high before the flowers are out. But alas ! we shall be away from this dear place when they blossom.

11th.—I had some confused idea that the great fossil animal, which is called the mastodon, was the same as the mammoth ; but my uncle told me to-day, that though the remains of the mastodon have some general resemblance to the elephant, yet there is no doubt that they were quite distinct animals. The bones of the mastodon have been found in great numbers both in North and South America, but no complete skeletons have yet been put together. A small species of this animal has been discovered in Saxony, as well as in some other parts of Europe ; and naturalists now divide the whole family into five species. The principal points of difference are not only the disposition and shape of the grinding-teeth, but the bulk of the animal ; for the great mastodons that have been found on the

banks of the Ohio must have stood twelve feet high.

My uncle had before told me that the term mammoth came from Russia; it is said to be of Tartar origin, derived from *mama*, which signifies the earth; for the Siberians believe that elephants of that description still live under ground. He says that their tusks are found in such abundance in Eastern Siberia, and in the Arctic marshes, that almost the whole of the ivory-turners' work, in Russia, is made from Siberian fossil ivory, and that it is not at all inferior in quality to the living ivory of Africa and Asia. Although for a long series of years thousands have been annually procured from the banks of the rivers, and from the shores of the Frozen Sea, yet they are still collected in abundance. The best fossil ivory is found in the countries within the Arctic circle, where the ground is thawed at the surface only during their very short summer.

The remains of two other huge animals have also been discovered in America, the megatherium, about the size of the rhinoceros; and the megalonix, which was something smaller. From the construction of their teeth they were both herbivorous, and M. Cuvier supposes their prodigious claws to have been employed in digging up roots. They appear to be different species of the same family; and, though related to the sloth genus, they are, like the mammoth and

mastodon, entirely extinct. I asked him how he knew that they were extinct, and he told me it was quite impossible that they could still inhabit the interior of America, without its being known to the European settlers on the sea-coasts ; some of them, in the course of time, must have strayed out of the forests, and have been observed by travellers ; or, in our constant intercourse with the natives, who have traversed the country in all directions, some accounts of such large animals must have reached us. In South America the Indians point out these large fossil bones as the remains of gigantic monsters, which would have destroyed the whole human race if they had not been themselves destroyed by the interference of the Great Spirit. Nor is it likely, continued my uncle, that any of the other animals, which we know to be extinct now, should have existed since the deluge : no great catastrophe since that time has happened, which could have been equal to the sweeping away of a whole species ; and almost all those that at present inhabit the three continents of the old world, are mentioned in the writings of Aristotle, or of other ancient authors. The Romans had such a passion for collecting wild beasts, that in the time of Commodus, twenty lions, twenty African hyenas, and ten tigers, were killed in one day's sport at Rome ; and thirty-two elephants, a hippopotamus, and ten camelopards, were exhibited

there at the same time. To such industrious hunters and showmen there could have been few species unknown.

My uncle mentioned a curious circumstance, which, he says, has not been much noticed: that none of the extraordinary animals which inhabit 'New Holland's continental isle' have ever been found among the fossil remains in any other part of the globe; and of the fossil strata there, very little is yet known.

I asked him if there was any foundation for the chimera, and the other imaginary monsters of the ancients. 'Those ideal creatures,' he replied, 'may be partly referred to the marvellous traditions that accompany the early records of all nations, and partly to the habit, which was so prevalent in those times, of describing real objects as well as passions and events by means of metaphor and allegory. It would be childish to expect that we should now find in any part of the globe remains of such animals as the flying pegasus, or as the sphynx of Thebes, but we must not reject as altogether fabulous those which appear in the hieroglyphics of Egypt and Persepolis. The rude sculpture of those ages has perhaps been the common source of many mistakes; for the most simple and natural method of drawing any animal is by its profile; and in this way, the oryx and the unicorn may appear to have had but a single horn, although

the bas-relief or outline might have been intended to represent the antelope or some other creature with two horns.'

12th.—There were so many changes from brightness to cloudiness this morning, that, as my uncle rose from the breakfast-table, he repeated these lines so descriptive of those rapid alternations :

' With every shifting gleam of morning light
The colours shifted of her rainbow vest.'

I asked him where those lines were to be found?

' Is it possible,' said he, ' that you have never read the "Tears of old May-day!" Well then, Caroline will, I am sure, be so kind as to shew it to you; and I think you had better celebrate this famous day, by writing an explanation of this beautiful poem, now so little read.

' You may explain it, if you can, in the style of " Readings on Poetry;" a very favourite book, you know, in this house. If any of the mythological allusions are not quite obvious, I will endeavour to explain them; and I will now only premise that the poem proceeds on the Eastern idea, that the year begins in May :

" For ever then I led the constant year,'

is therefore quite in character for

" The flow'ry May, who from her green lap throws
The yellow cowslip, and the pale primrose.'"

This was a terrific task, and occupied me great part of the morning. At last, when it was finished, I came to the hall to refresh myself with my cousins at a new play, called *La Grace*, or the *Flying Circle*, which we have lately imported, and the description of which will probably divert Marianne more than any learned dissertation of mine on the ‘Tears of old May-day.’

Two people stand at opposite ends of the room, as in playing shuttlecock; each holds two nicely turned sticks, one end of which is pointed; and by a dexterous movement of these pointers, a light, elastic hoop, about eight inches diameter, is sent flying forward towards the person opposite, who catches it on her pointers, and immediately lets it fly back again. When played with two hoops it is still prettier, and requires much more expertness than shuttlecock.

Mary and I had played at it successfully for some time, when we were interrupted by poor little Grace, who, looking very sad, ran into the hall, put her pencil-case into Mary’s hand and vanished, brushing away a large tear from her cheek.

Mary followed her, and afterwards told me that she had given Grace a silver pencil-case some months since, on condition that she never would again scribble in books; a habit which she had unaccountably acquired. Grace, delighted to have her long-wished-for pencil-case, agreed to

the compact, and punctually kept it till this unfortunate day. The moment that she recollected herself, she came to return the pencil to Mary, with true honesty indeed, for she had only scribbled in one of her own little books, which might never have been observed. Though sorry that she should thoughtlessly have broken her engagement, yet all were pleased at finding that she had that fine principle of honour which disdains deceit. My aunt has certainly contrived to fix steady good principles in the hearts of my cousins, which really influence their conduct. Instead of having to watch them, she places the most perfect reliance on their integrity; and most justly, for I, who see them at all times, know that they have not mere show-sentiments or show-manners; but that they are just the same when not observed by their mother as when in her presence.

13th.—I believe I noted in my journal, that I had been practising the art of *budding*. As soon as I had acquired a little expertness, I tried my hand on various roses, just as the leaf-buds began to swell, having seen, in the 'Transactions of the Horticultural Society,' that period recommended as the best for roses. The April showers were of great use, and most of my buds have now become nice flourishing shoots. Yellow roses are said to thrive particularly well, when budded on the China-rose, and I hope

mine may not be attacked by those troublesome little green caterpillars that ate away the heart of the buds on Mary's yellow rose last year. She kept one of them, which changed into a small brown chrysalis, and this morning it has become a very pretty buff moth, marked all over in brown patten work ; it is small, but the antennæ are as long as the whole moth, circular and bowed towards its nose like cow's horns.

I have also several young rose *grafts* of different species growing on the wild rose—

‘ Of simpler bloom, but kindred race,
The pensive Eglantine——.’

Mr. Biggs asserted that this process would improve their colours. I thought it rather extraordinary that the ‘ simpler bloom’ of the wild rose should have that effect ; but my uncle said, ‘ Try the experiment first, and reason about it afterwards.’

When I shewed these budded roses to Miss Perceval, I expressed my surprise that amongst the numerous South American plants which have been collected in this country, I had not heard of any new species of rose.

‘ Are there any native roses in South America ?’ she asked.

‘ Oh ! of course,’ said I, ‘ in such a flowery country. You know there is an island in the Rio de la Plata, called the Isle of Flores, which I suppose is covered with flowers.’

‘Can you describe any of your indigenous Brazilian roses?’ said she, laughing.

After considering some time, I was obliged to acknowledge that I could not recollect any one that I knew to be a native of Brazil.

‘This is one of the numerous instances of *taking for granted* which we meet every day,’ said she. ‘You imagined that the rose must be wild in all parts of the world because it is everywhere cultivated:—you will therefore learn with surprise, that it is generally believed that all the roses yet known have been found between the 19th and 70th degrees of north latitude; none, therefore, belong to South America, though the profusion of China roses, cultivated in Brazil, might very naturally have given you the idea of their being natives. It is possible, however, that hereafter new species may be discovered south of the line, which will come under the head *Rosaceæ*, for the industry of botanists has wonderfully increased this family in a few years. In Wildenow’s book, published in 1800, he enumerates only thirty-nine species, yet there are upwards of one hundred now known and cultivated in this country; and a foreign professor has given a list of even two hundred and forty species. He proposes to divide them into twenty-four series, each of which is to bear the name of some botanist who has distinguished himself by a knowledge of that beautiful genus :

for instance, *Rosa Candolliana*,—*Wildenowiana*,—*Pallasiana*, and so on.’

She told me also that all the apple and pear tribes are placed in the natural order of *Rosaceæ*: in the rose, the calyx, which is pitcher-shaped, incloses the germ; and in the former the germ is beneath the calyx. She mentioned, too, as a curious circumstance of the dog-rose or eglantine, that the farther north it is found, the more woolly are the styles, while to the southward, as in *Madeira*, they have no hairs whatever.

The rose seems to be prized particularly in Persia, where it is the chief ornament of the garden. In that very entertaining book, ‘*Sketches of Persia*,’ the author mentions a breakfast which was given to him at a beautiful spot in the vicinity of Shiraz:—

‘We were surprised and delighted to find that we were to enjoy this meal on a stack of roses! On this a carpet was laid, and we sat cross-legged like the natives. The stack, which was as large as a common one of hay in England, had been formed without much trouble, from the heaps or cocks of rose leaves, collected before they were sent into the city to be distilled.’

In Foster’s *Travels*, too, Mary shewed me a description of the city of Kashmire, where the houses, though slightly built, have flat roofs of sufficient strength to support a covering of earth; this is planted with roses and other

flowers, and gives the town a very beautiful appearance. The earth also preserves the houses from being chilled by the quantity of snow that lies on them in winter; and in summer it gives them a refreshing coolness. Every creature he met had roses in their hands; and you may recollect, Mamma, that the same thing is said of the city of Bisnagar, in the Arabian Nights' Tales. The province of Kashmire, Foster says, has been always famous for roses, particularly for one extremely fragrant species, of which the best attar of rose is made; but it will not grow in a more southerly climate.

He mentions a lake, near the city, in which there were several islands covered with rose-trees; they were all in brilliant blossom when he was there, and looked like large baskets of roses. How pretty the floating Chinampas of Mexico would be, if they were planted with the Kashmire rose; or, what would suit them better, with the little rose of Jericho. Miss P. says this is one of the most singular plants in the world, and is found nowhere but in the deserts of Arabia. It is only six inches high, root and all; and its tiny branches curve inward, so as to inclose its numerous flowers in a sort of hollow globe. I think this may be truly called a Lilliputian tree.

14th, Sunday.—The thirty-second chapter of

Deuteronomy, or the Song of Moses, was the subject of our conversation this morning. My uncle told us that it consists of six parts.

‘ It opens in the first five verses with a summons to the whole universe to listen to the inspired voice of the prophet ; and contrasts the power, truth, and justice of God with the iniquities of the “ perverse generation ” whom he was addressing. In the next nine verses he expatiates on God’s continued indulgence and more than fatherly affection towards the Israelites ; he makes an affecting appeal to their gratitude ; and he dwells on the unceasing protection they had experienced from their first helpless origin up to their entrance into the rich land of promise, in a manner which shows that Moses spoke from a full recollection of the scenes he had witnessed, and that he deeply felt the extent of the Almighty power and goodness.

‘ In the expression, “ When the most High divided to the nations their inheritance,” we are to understand the tribes of Israel ; each of which, from their extraordinary increase of population, might be considered as a nation in itself, while the whole composed “ His people,” the most highly favoured of all the nations of the earth.’

I begged of my uncle to explain what was meant in the thirteenth verse, by ‘ He made them

ride on the high places of the earth ;' and afterwards by ' sucking honey and oil out of the flinty rock.' He answered, ' The former phrase applies to the victories which the Israelites had already achieved through the Divine assistance, as well as to the final conquest of the land of Canaan by the same means. The honey and oil are allusions to the fruitfulness of the country, which abounds with wild bees, who build their honeycombs in the rocks ; and with the finest olive-trees, which it is well known strike their roots into the rocky crevices.

' The third part of the song,' he continued, ' begins with the fifteenth verse, and describes the usual effect of prosperity upon a thoughtless and ungrateful people. " But Jeshurun waxed fat and kicked." This figure of speech is probably taken from a pampered horse, who becomes unmanageable and vicious ; and you will find it repeated in Hosea*. " According to their pasture they were filled, and their heart was exalted ; therefore they have forgotten me." Jeshurun is derived from a word signifying upright, and is put here, as well as in Isaiah, for Israel. It would not be very difficult to apply the whole of this passage to more modern nations, who have far less excuse than even the Israelites for " forsaking God, and lightly esteeming the rock of their salvation ;" but, as

• Chap. xiii. ver. 6.

individuals, at least, we may take a useful lesson from it; let us beware of the seductions of prosperity, lest our hearts become too much engrossed by the happiness that we enjoy, or too much depressed by the salutary disappointments that we sometimes undergo.

‘ The fourth part, from the nineteenth verse to the end of the twenty-fifth, expresses the indignation of the Lord, and his threats of rejecting apostate Israel, and of adopting in their room the believing Gentiles. It is quoted by St. Paul, as having that interpretation; and I will only further remark, that it is written with the most awful strength that language can supply, and that all its denunciations have been literally accomplished.

‘ The fifth division, to the end of verse thirty-five, states the wise and gracious reasons of the dispersion of the Jews into all lands, both for their ultimate preservation, and to prevent their enemies from vainly ascribing to themselves their destruction. It was not indeed from any merit of their own that those enemies were allowed to triumph—they were only employed as the instruments of punishment; and God declares in the sequel that they will have to answer for their own corruptions and idolatries in the day of vengeance.

‘ “ For their rock is not as our Rock; even our enemies themselves being judges.” This

remarkable passage was evidently introduced by Moses in a parenthesis. He prophetically knew that their conquerors would often have to confess the superiority of the God of Israel over their own deities ; and accordingly many examples of it may be collected in Scripture. I need scarcely remind you of Nebuchadnezzar's decree, when he perceived the three faithful Jews escaping unhurt from his fiery furnace * ; nor of his touching acknowledgment of the one true God when he regained his reason † ; and in profane history you no doubt recollect the declaration of the Roman emperor Titus, after the conquest of Jerusalem,—That he was only an instrument in the hand of God, whose wrath had been so signally manifested against the Jews.

‘ The last part of this celebrated song is called the consolation of Israel : it holds out a gracious promise of future reconciliation when they should have repented of their obstinacy, and abjured the vain idols in whom they had trusted for protection ; it gives an awful warning to their oppressors, that the day of account and of vengeance for them also will come ; and the words in the concluding verse, “ Rejoice, O ye nations with his people,” seem to have been cited by St. Paul ‡, to prove the future conversion

* Daniel iii. 29. † iv. 34. ‡ Romans xv. 10.

of both Jews and Gentiles to Christ, and their mutual exultation in his then undivided kingdom.'

15th.—I seized an opportunity of asking my uncle some questions about the beds of coal in the forest of Deane, and I learned that the coal formation there is an irregular elliptical basin, occupying nearly the whole of the forest tract. It is ten miles long, and six broad; and all the strata dip uniformly to the centre of the basin. He showed me the extent of it on a geological map, which he has made of this county; and which marks in the prettiest manner all the principal strata. Each kind of rock has a particular colour, so that its extent is seen at a glance; and by a section at the bottom of the map, the dip or inclination of the strata, and the manner in which they lie on each other, are very distinctly shown. He made Caroline and me observe that we could trace on it the mountain-lime and old red-sandstone (which inclose the coal-field) across the river Wye into South Wales: there, he says, they contain another coal district, of much greater extent; and he showed it to us in Mr. Greenough's beautiful geological map of all England. I should never have been tired of looking at these maps, if Caroline, who knew how little time my uncle could spare, had

not asked him something about the origin of coal.

‘ Before I answer that question,’ said he, ‘ we must have a little discussion on the nature of *peat* ; a substance which seems to be very closely allied to coal, and which, there is no doubt, has been produced by the decay and decomposition of vegetable matter. There are different kinds of peat, therefore, according to the different kinds of plants of which it is composed, and the different situations in which the process has been carried on ; such as marsh, forest, and marine peat. Some extensive bogs have been caused within the memory of man, by the decay and natural fall of forests, over which the *sphagnum palustre* and other mosses rapidly spread ; agricultural implements and various domestic utensils have been found under them ; and we may therefore assume, that as peat appears to be in the act of progressive increase, it belongs to an order of causes still in action. When examined, peat appears to be an entire mass of vegetable *fibres* : towards the surface they are nearly in an unchanged state, but in the middle the peat becomes more compact ; and at the bottom of a very deep and ancient bog, they are almost obliterated, the substance being dense and black, and having all the chemical characters of jet. In some in-

stances beds of peat alternate with beds of mud or sand, which must have been deposited in the bottom of lakes, and in these cases they appear something like an incomplete coal formation.

‘ In a short time,’ continued my uncle, ‘ we shall have a better opportunity of studying this curious substance, if your interest in it continues, when we are in Ireland, as that island contains a greater proportion of bog than any country with which we are acquainted.’

‘ My interest in it, my dear uncle,’ I replied, ‘ is not very likely to fail while I have your kind assistance ; but as we are as yet in a coal country, perhaps you will tell us something of the formation or origin of that mineral.’

‘ There is no possible doubt,’ he said, ‘ that the general origin of coal must be referred to the vegetable kingdom ; and I began with peat, to show you how masses of vegetable matter may be collected in thick and very extensive beds, ready for whatever process nature may afterwards employ in converting them into coal. Some species of coal are merely fossil wood (or *lignite*) impregnated with bitumen : the branches, trunks, and roots, though closely pressed together, are scarcely altered in texture in some places ; while in others they gradually lose every vegetable feature, and the substance, in colour, lustre, and fracture, resembles pitch. Of this nature is the Bovey coal of Devonshire, and the Surturbrand

of Iceland ; and I have some specimens of the former, in which the fibres were flexible when I took them out of the pit, though now hard and brittle. From the disposition of those Bovey lignites, which lie in alternate strata with clay and gravel, it has been reasonably inferred, that the trees and vegetables of the adjacent mountains were washed down at different periods into a lake ; the clay and gravel, of course, sank first to the bottom, and formed the floor ; but in time the trees saturated with moisture, and, pressed down by an accumulation of other trees, sank also ; and were again, perhaps in succeeding ages, covered by successive depositions.

‘ The common, or cubical coal, as it is called from the shape into which it breaks, does not bear the same obvious marks of vegetable origin in its structure ; but where one species of coal can be so clearly demonstrated to be only altered vegetable matter, it would be bad philosophy to ascribe the other species to other causes. In the prodigious beds of coal, however, in Staffordshire, there is no want of vegetable traces ; and even in the Newcastle coal the impressions of leaves and branches are frequently found, as well as in the freestone and slate-clay which intervene between its numerous strata. At Kilsyth, in Scotland, a very singular specimen was discovered ; a tree standing upright, with its roots resting on a bed of coal, from which they could scarcely be dis-

tinguished, and its stem passing into a stratum of sandstone rock. The lower end was completely bituminated, and it burned with a clear flame ; yet the upper part, though scarcely altered in the grain or apparent texture of the wood, was converted into sandstone similar to that by which it was inclosed. Round the stem there was a space of about an inch in thickness, filled with coal, which renders it probable that the same process that converted the roots into coal acted upwards on the bark. The rock contains innumerable remains of plants ; some of which are so perfect that their species have been made out, and no pencil could trace their delicate ramifications with greater nicety.

‘ In short,’ continued my uncle, ‘ it appears more than probable, that every species of coal has proceeded from vegetable matter of different kinds, but under different circumstances ; and that its chemical change was effected under the pressure of deep water. In one stage of that process it must have been in a soft pulpy state, like the lowest part of a deep peat-bog ; for this is the only way that I can account for the impression of leaves, canes, seed-vessels, and shells, which are so commonly found on the external surface of coal.’

My uncle showed us a beautiful specimen of a fern leaf, where the impression was as perfect as if it had been made with wax.

He then continued, ' Sir James Hall thinks that peat may have been converted into coal by heat acting under great compression; and he has actually succeeded in making a substance very like it. When I have more leisure I will describe the ingenious process which he adopted, as well as some other experiments of the same nature, by which this distinguished philosopher discovered the means of fusing limestone, of imitating volcanic lava, and of forming solid sandstone from loose sand.

' But to return to our coals: the chief difference between the various kinds of coal which are applied to economical purposes, arises from the proportion of bitumen they contain. What is called *caking coal* yields about 40 per cent.; when burning, it swells, agglutinates, and emits much smoke and gas, which inflame at a certain temperature. *Cannel coal* has only 20 per cent. of bitumen, and does not agglutinate or cake. It burns with a bright flame like a candle, from which circumstance it takes its name—cannel being the common pronunciation of candle in the north of England. The third sort I shall mention is called *anthracite*, by mineralogists; but its common name is *blind coal* or *Kilkenny coal*, from a district in Ireland, where there are vast beds of it. It contains little or no bitumen; it neither cakes nor flames, and gives out very little smoke. But as there are several varieties

of coal between those principal species, much confusion has taken place in their names.'

16th.—When Mary and I were in the garden to-day, I observed a very odd appearance on the under surface of some of the leaves of a pear-tree; they appeared thickly set with strange little downy russet-coloured things, like spines, growing out of the leaf, perpendicular to it, and about a quarter of an inch in length, and very little thicker than a pin, with a protuberance or excrescence at the base.

Mary was amused at my surprise, and told me that they were the habitations of insects. She then took one of these tubes off the leaf, and on giving it a gentle squeeze, a minute caterpillar, with a yellowish body and black head, came out of the lower end; for the head is always downwards. We examined the place from which she had removed it, and I saw that there was a small hollow in the outer skin and pulpy part of the leaf, which had been eaten away by the caterpillar. It moves this little tube or tent from one part of the leaf to the other, and eats no other part than what the tent covers; and when these insects are abundant, Mary says that every leaf is covered with little withered specks, where they have feasted themselves.

The tube in which the caterpillar lives is

composed of silk, spun from its mouth almost as soon as it comes out of the egg; and as it increases in size, it enlarges the tube by slitting it in two, and introducing a strip of new materials. To preserve the perpendicular posture of its tent, this ingenious insect attaches several silken threads from the protuberance at the base to the surface of the leaf; but it has a still more singular device to protect the tent against any violence: it forms a vacuum in the protuberance at the base, which fastens it to the leaf as effectually as if an air-pump had been employed. This vacuum is caused by the insect's retreating, on the least alarm, up the tube, which its body so completely fills, that the space below is free from air, and the tube is pressed down like the exhausted receiver of an air-pump.

Mary easily convinced me of this when she seized it suddenly while the insect was at the bottom; the silken cords readily gave way, and the tube was detached by a very slight force; but when she touched it gently, giving the insect time to retreat, we found that a much stronger effort was required to loosen it. As if aware of the effect of the admission of air from below, this little philosopher carefully avoids gnawing quite through the leaf; and when he has eaten as deeply as he can venture, he cuts the cords of his tent, and pitches it on a fresh part of the

surface. When it has attained its perfect state, it becomes a small brown moth.

17th.—Mary has been trying a grand experiment, which has succeeded so well, that Mamma must have an account of it.

My uncle determined to remove a valuable jargonelle pear-tree from one wall to another. I forget his reason, but no matter; it was, however, much too late in the season, and the tree sickened, and seemed to be dying. The gardener declared it could not live; but Mary, who had read that trees in such a predicament might be saved by a gentle but continual drip of water being guided to the roots, requested my uncle to let her try the effect of this plan. He is always anxious to encourage useful experiment, and willingly consigned the tree to her prescriptions.

She took two large flower-pots, and, having carefully corked the holes, she suspended one to each end of a stick, which was fastened across the stem of the tree. A piece of cloth-listing or selvage, long enough to reach the ground, was put into each pot, with a stone tied to it to prevent its slipping out; and the other end of the listing was slit into three parts, which were slightly pegged into the ground. She then had the pots filled with water, and the whole of the

listing being wetted, each of them acted like a syphon, drawing the water up over the edge of the pot, as my uncle says, by capillary action, and conducting it slowly and regularly into the ground. The moisture spread to the roots, and in three days the young leaves began to revive. The pots were filled every morning, and she changed the listing once a week, as the filaments of the cloth became clogged, and the water was not so freely transmitted. The daily improvement of the tree was very gratifying to my uncle, who enjoyed Mary's ingenuity and success; and even the gardener has this morning pronounced it to be out of danger.

18th.—I am afraid that my dear Mamma will call me a little credulous simpleton, when she reads this account of the singular sagacity of a cat; but my aunt took great pains to ascertain that it was quite correct.

Dame Moreland has some remarkably fine cats, and she is in the constant habit of drowning all their progeny, except one kitten of her favourite, Mrs. Snowtip's, which she selects with due attention to its beauty. This time, however, pussy thought proper to choose that one for herself, and carrying it from the garden into the house, she left the rest to perish. Accustomed

to their being regularly taken away, she seemed to agree to that arrangement, and devoted herself to the one she had saved.

A few weeks afterwards another of the cats kittenned ; and its whole brood being destroyed, the poor thing became very uneasy, and suffered much from the want of her little ones to relieve her of the nourishment provided for them. On which, the fat Mrs. Snowtip being very ill-supplied herself, actually employed the poor bereaved cat as a nurse. This office she performs with proper fidelity, and the two ladies agree perfectly ; for while the nurse feeds little Snowtip, the mother smooths and dresses it herself, and, on any alarm, flies to its protection, while the nurse seems contented with doing her own duty, and never interferes on such occasions.

19th.—I have had a good deal of work at my strawberry-bank, for Mr. Biggs warned me that the beds ought never to be dug, but constantly hand-weeded ; and he recommended, also, that the runners should be nipped off as soon as they appeared. I undertook to do all this myself ; and both weeds and runners seem determined that I shall not be idle.

This strawberry-bank is such a very dry soil, that I found the plants wanted water continually ; and I asked my uncle to let a little channel be

made, for the purpose of bringing to the top of the bank a small rill that runs across the back of the shrubbery. Something I had heard about *irrigating* meadows suggested this idea, and my uncle approved. The channel has been cut, and it brings the water on a level along the upper edge of my bank, from whence it trickles down the slope along each row of strawberry-plants. When they have had enough, I put a slate edge-wise across the channel, which acts as a little sluice, and turns the water aside into the pond. This method of watering has so far answered very well, for I think my strawberries look more healthy than any of the others; they are now in full flower, and I am in high hopes of having the first and best fruit to present to my uncle for his kindness.

20th.—I had a long walk, yesterday evening, with Miss Perceval and Mary, through some of Farmer Moreland's fields, which are shut up for meadow. The grasses are opening their blossoms, and Miss Perceval taught me the names of several that I had not known. She then asked me if I could describe the leading characters of the grass family.

I considered, and hesitated, and tried; but my attempts were very awkward, and I acknowledged that trials of that sort were sometimes

exceedingly useful in making us acquainted with our own ignorance. She smiled, and put the same question to Mary.

Mary said, ‘ I will do my best, but on condition that you will tell me where I am wrong. The stem is generally smooth, and its hollow cylindrical form enables it to stand upright, even when four or five feet high ; it is usually jointed, which gives it additional strength ; and it is terminated by the flowers, which are either tufted, or in spikes, or paniced :—the leaves are alternate, and always undivided—one of them springing from each knot, and enveloping the stem with a sheath, which is split down to the knot. All grasses have a chaffy flower inclosed in a glume or husk ; and each flower has a single seed. These are all the general characters that I can recollect, which mark the tribe distinctly.’

‘ Very clear indeed,’ said Miss Perceval, ‘ and quite full enough. The grasses are easily distinguishable from all other plants, except the Cyperacea ; and even they show a well-marked line of separation, as their stems are sometimes triangular, and very seldom jointed ; and the sheath is always entire, not split, like that of the grasses.’

‘ The grasses are of the greatest importance,’ she continued, ‘ in the economy of nature ; they form, in most countries, the chief covering of the

earth ; they are the principal support of terrestrial animals ; and you know that the basis of all agriculture is the cultivation of plants which belong to their order.'

Miss P. easily allows herself to be drawn out, and before we reached home, we obtained the following particulars of that numerous family.

' There are about eighteen hundred species already known ; and the industry of botanists is every day adding to the list : there are both land and fresh-water grasses, but no marine grass. They occur in every soil ; generally in society with other grasses, but sometimes a single species will be found occupying a considerable district. Sand appears the least favourable to their growth ; but even sand has species peculiar to itself. They are spread over the whole vegetable kingdom, from the equator to the polar regions ; and from the sea-shores to the tops of the highest mountains, at least to the line of perpetual congelation.

' We are still in want of a perfect natural classification, by which their distribution on the globe might be made more distinct : at present, each of the ten groups into which they are arranged, contains too many, so that not one of the groups belongs exclusively to any one zone. Some, however, may be regarded as tropical, and some as chiefly inhabiting the temperate climates. The variation of the grasses in

the different continents is still less perceptible; there is scarcely any difference between those of North America and those of the temperate regions of the European continent. Between the two temperate zones, also, the distinction is inconsiderable. Of thirty-six species from the Cape, thirty occur in the northern hemisphere; while in other tribes of plants, Southern Africa has many that are peculiar to itself. I may mention *poa* as being one of the most extensively distributed genera; some of its species are found in every part of the world, from Spitzbergen to New Holland.'

'We may say then,' said Mary, 'that latitude has but little influence on these plants.'

'Yes, it has a decided influence,' said Miss Perceval, 'on their vegetation; the tropical grasses acquire a much greater height, and almost assume the appearance of trees. Some species of the bamboo, which you know belongs to this tribe, are fifty feet high. The leaves too are broader, and approach more in form to the leaves of the other families of plants.'

I then asked Miss P. to give me some idea of the distribution of those grasses which are cultivated.

'The cultivated grasses,' she said, 'which extend farthest to the north in Europe, are barley and oats. These, which in milder climates are not generally used for bread, afford the inhabi-

tants of Norway, Sweden, and Scotland their chief vegetable nourishment. Rye comes next to these; it is the prevailing grain along the borders of the Baltic, and in part of Siberia. Next follows a zone including Europe and a large part of Western Asia, where rye disappears, and wheat almost exclusively furnishes bread.

* The next district extends across Barbary, Egypt, Persia, and the countries of the East, where, though wheat abounds, rice and maize are extensively cultivated; and in some of those countries the sorghum, which yields a grain resembling millet, and the *poa Abyssinica*, are largely used by the inhabitants. In the eastern parts of the temperate zone, including China and Japan, rice predominates over all other grains. Between the tropics, maize prevails in America, rice in Asia, and both in nearly equal quantities in Africa; probably because Asia is the native country of rice, and America of maize. The native country of wheat has not yet been ascertained, but there are few places into which it has not been introduced. Several other grains and plants that supply food, are cultivated in the torrid zone, but we cannot touch on them now, as they are not grasses.

* In the Highlands of South America, there is a distribution similar to that arising from difference of latitude. Maize is not found beyond the height of six thousand feet; from thence to

nine thousand feet the European grains abound, advancing upwards in this order; wheat, then rye, and then barley. The larger esculent seeds of the grasses were named, by Linnæus, *Cerealia*, from Ceres: he included rice, wheat, rye, barley, oats, millet, and maize.'

This morning we were talking over all we had learned yesterday from Miss P. about the grasses, when my uncle invited us to his study, and showed us some dried specimens of feather-grass which grows in Europe, and is larger and more curious than the pretty little species that you have in Brazil. The feather is six inches long, with a kind of a spiral form at the lower end, which twists or untwists according to the degree of dampness in the atmosphere. We held a piece of it over the urn at tea, by which it was instantly put in motion, so that it would make a very nice hygrometer. I wish I was acquainted with Harry and Lucy, and I would send them the bit my uncle gave me. Miss P. says that, as the seed ripens, the flower closes over it into a sharp point; and that, as the stalk is slightly barbed, it works its way into the ground by the effect of damp acting on the twisted part.

21st, *Sunday*.—I asked my uncle this morning to explain what he meant by the Levitical dispensation, and by the New dispensation, to which he has so frequently alluded.

‘ I will with pleasure, Bertha,’ said he. ‘ It gives me great satisfaction to perceive that you reflect on what you are told. Never allow yourself to be contented with half knowledge.

‘ You know that, in consequence of the fall of man, a system of divine grace for his redemption was promised by the Almighty ; and that it commenced with the mysterious promise, that the seed of the woman should bruise the head of the serpent. But as things in the natural world are only permitted to reach perfection gradually, rising from infancy to maturity, so it is, likewise, in the moral world ; and this gracious scheme of mercy, instead of being at once displayed in its full extent, was gradually unfolded at different periods, until the promised seed was at length manifested in Jesus Christ. These successive communications have been called dispensations, because the knowledge of God and of his merciful intentions were *dispensed* or revealed by them. There have been three of these dispensations—the patriarchal, the Levitical, and the Christian ; but they belong to the one system of Providence, and are all linked together, the redemption of the human race being the beginning and the end of the whole. The proper modes of worship were at the same time distinctly ordained ; and, however different the institutions which were severally dispensed may appear to us, we may feel assured that each of them was peculiarly

adapted to the moral state of the world when it was promulgated.

‘ During the term of the patriarchal dispensation, which comes first in order, it pleased God to make known such a portion of his will, and to dispense throughout the world such a degree of knowledge of his purposes, as would have been abundantly sufficient to have conducted mankind to heaven, if they had not wilfully resisted the benevolent offers that were made to them, and turned aside from the easy path of duty that was prescribed. The patriarchal dispensation was evidently intended to be *universal* in its offers, as well as in its conditions; for Adam would of course communicate to the numerous generations of his children, with whom he was contemporary, the knowledge, which he had himself derived from direct revelation, of God’s gracious will and intentions. But this universality was of short duration. Animal sacrifice appears to have been appointed as a type of that mighty sacrifice or atonement by which mankind were to be enabled in the fulness of time to triumph over their spiritual enemy; and the conduct of Cain in rejecting it produced an immediate distinction between the servants of God and those who were seduced to follow the principles of his apostacy. The terms on which that general atonement had been offered were neglected; the reconciliation of fallen man by means of the

promised seed was slighted, and the lamentable corruption which spread amongst the early inhabitants of the world led to the awful judgment of the Deluge.

‘ Thus ended the first period of the patriarchal church. It was renewed in the descendants of Noah, and for a long period retained its original character of universality, till other apostacies took place. These, however, were of a very different nature from that of Cain. The occasional appearances of a superior race of beings, ministering under a human form between God and his creatures upon earth, probably led to what has been called Hero-worship. Surprising as this perversion may appear among people whose immediate ancestors had the singular advantage of direct communication with the Supreme Being, it seems to have taken deep root in the human mind ; for, in the most enlightened nations of antiquity, we find a continual disposition to look back on departed heroes and conquerors, not only with a sort of pious veneration, but even to consider and address them as tutelar deities. Always prone to be led away from the plain and simple truth, human weakness found another early source of corruption in the worship of the heavenly bodies : their splendour, and their obvious influence on all the pursuits of mankind, produced a superstitious reverence, which by an *easy transition* degenerated into adoration ; and

it has been remarked, that in the early records of almost every country we find that the sun and moon were regarded as deities, and that fire was the constant emblem under which they were worshipped.

‘The prevalence of these idolatries after the Deluge may be inferred from various passages in the Scriptures, and particularly from the direct prohibitions contained in the laws that were given to Moses. But amidst all the depravities and abuses that had thus disfigured the patriarchal religion, the belief in the necessity of expiatory sacrifice was constantly maintained; and though the horrid corruption of that tenet gave rise to the sacrifice of human victims, there is no doubt that they dimly shadowed out a general belief in a future divine victim. Thus you perceive that, revolting as all these impious corruptions were, yet they had for their original foundation the very principle of the system of atonement and redemption—that “without shedding of blood there is no remission of sins.”

‘The consideration of the other two dispensations we must defer, my dear Bertha, to another opportunity.’

22nd.—Mary and I went this evening in search of the moth of the little pear-leaf caterpillars: we shook a gooseberry-bush, and numbers of them came forth. They fly in the day-time, never

going far at a time, and cautiously conceal themselves in the nearest bush.

This little (*seratella*) moth is of a brownish colour, with numerous black dots and stripes on the fore wings, which are beautifully fringed with feathers. The inferior wings are very small, and have also a fringe on the margin. This moth is particularly distinguished by the extreme length of the hind feet ; they are twice as long as the body, and are thought by some to act like a pair of oars in regulating their flight, and in helping to maintain the body in equilibrium.

My aunt told me that some years ago the depredations of this insect were considered as a species of blight ; and the insect was so little known, that no description of it was to be found in either French or English entomologies. She believes that every blight that affects our fruit-trees is produced by insects, whose visits are encouraged by certain dispositions of the atmosphere. The germs of the future race are lodged ready to be called into existence whenever the weather be favourable to them. The cure then must be to eradicate the germ, but this can only be known by tracing the habits of these minute creatures. ' What a field,' added my aunt, ' for exercising the industry and observation of young people ; and not only in acquiring knowledge, but in turning that knowledge to useful purposes !'

24th.—We accompanied my aunt and uncle yesterday in a very pleasant expedition. We boated to Elmore early in the morning to breakfast with Mrs. Maude, and heard some very entertaining letters from her daughter, which she was so kind as to read to us.

Miss M. has been in town for three weeks, and the friends she is with have made great exertions to show her everything interesting. In the midst of all her hurry, however, she has written constantly home, describing all she does, and sees, and thinks, that can interest her father and mother. She was not very fond of early rising; but now, in order to prevent anything from interfering with these letters, she has the resolution to get up and write them before her friends' breakfast hour. She has almost excited my envy by her repeated visits to the British Museum—to galleries of beautiful paintings—to botanic gardens and stoves—to collections of beasts, and birds, and insects,—to tunnels and suspension bridges, and to all sorts of curious machinery; and she has had the great advantage, too, of having seen all these things in company with people who could explain them to her. Alas! such things can be found only in London.

After we had heard these letters, we went on to Gloucester, where I had not yet been; and though it was not London, I had the pleasure of

seeing a great deal that was quite new to me, and very interesting.

The pin manufactory we saw in every part, from the straightening the brass wire before it is cut into the proper lengths, to the last operation, by which the pins are whitened. But as Mari-
anne will find all the particulars detailed in the Book of Trades, I will only say, that the thing which seemed to show the most expert fingers, was the putting the pins into the heads, and riveting them by a slight blow on an anvil. This is done by children, who take the heads out of an iron pot in which they have been heated, and instantly pop the bits of wire into them; and the never-failing exactness with which it is done is really wonderful. My uncle afterwards told us that a patent has been lately obtained for a very ingenious improvement, by which the head is raised upon the wire itself, so that the whole pin consists of a single piece of brass.

The sticking the pins into the papers, which are folded and placed against the edge of the bench, is also very curious. And when I recollected the great variety of people who had been employed in preparing the materials from the time the metals were dug out of the mine till the wire was drawn, along with those whom I had just seen engaged in the different operations in this manufactory, I could not but feel astonished that one small article of female dress should cost *such accumulated labour*.

We then walked to the cathedral. What a magnificent building, Mamma! the twelfth part of a mile in length, and more than two hundred feet high. As to the interior, it is grand beyond anything I can attempt to describe, but you must remember it too well to make that necessary.

I will mention, however, a curious circumstance that my uncle told me as we were passing among the monstrous pillars of the nave: an attempt was made not very long ago to reduce them in size, or to chisel them into cluster columns; but they were found to be only hollow cases of masonry filled with loose stones. I could not help feeling glad that it had failed, for the contrast of their heavy, solid appearance, with the light elegance of the cloisters, I think improves each other. The choir is beautiful; and often as my aunt and uncle had seen them, they could not help stopping to admire the carved work and tracery of the stalls.

This fine cathedral was begun in the eleventh century, the cloisters were added in the fourteenth, and the west front was not completed till the fifteenth. My uncle took the opportunity of showing me the different styles of Gothic architecture belonging to those periods; and on our road home, he explained the principal distinctions between the Saxon, Norman, and English styles, and the gradual alteration of the circular,

sharp pointed, and flat arches. The subject was entirely new to me, but I felt so much interest in it, that he has promised hereafter to go through a little course of architecture with me, from the Egyptian and Grecian to the Roman and Gothic.



25th.—We were talking to-day about the impressions of plants perceptible in coal, and I asked my uncle to tell me what plants they were. He referred me to Miss Perceval, who says that it appears from the researches of several German botanists, and particularly from those of Dr. Martius, that some of the Brazilian plants, which are so familiar to us, dear Mamma, seem to have such a resemblance to those impressions, that there can be scarcely a doubt of their identity.

‘The tree ferns,’ she said, ‘exhibit several characters in common with those ancient plants; one species in particular, the stem of which having a remarkable *tesselated* or chequered appearance, exactly represents some of the petrified forms found in the German coal mines. Dr. Martius describes ten different kinds of fern found in coal, each distinctly marked by some of those peculiarities which distinguish the living plants.

‘As very numerous examples of the arborescent as well as the herbaceous ferns occur in

the coal formation, it can scarcely be doubted that this order of plants was formerly much more numerous than it is now ; and that the forests of the primitive world were abundantly stocked with them.'

'That is the more probable,' said my uncle, 'as there is reason to suppose that ferns were among the first plants that spread over the surface of the globe, and that they were the basis of a more general vegetation, by preparing the ground for others—their large fronds probably deriving as much nourishment from the atmosphere as from the earth ; while their annual decay rapidly increases or improves the productive soil.'

'I do not mean, however,' said Miss Perceval, 'that the antediluvian woods consisted entirely of ferns ; for the remains of many other plants, and of some large trees, are found mixed with those of fern—just as the living woods of the equinoctial regions, though very rich in ferns, consist of a great variety of plants of all sizes. Several specimens of palms, and of bambusæ, have been discovered ; and the cactus is another tribe which appears very abundantly amongst these petrifications.'

'And I believe,' said my uncle, 'that the remark I made respecting ferns may be repeated of those tribes,—that they are furnished with a singular structure of organs adapted for respira-

tion, and thereby for inhaling nutritious juices from the atmosphere.'

'Yes,' said Miss P., 'Saussure found that a single leaf of the cactus opuntia inhaled four cubic inches of oxygen in the course of a night from the atmospheric air in a glass vessel, in which he inclosed it; and we may, therefore, consider those tribes, and the yuccæ, and lychnophoræ, which flourish in a dry sandy soil, as the pioneers of vegetation, and intended by Nature to inhabit the rude wastes of a new world.'

After some further conversation on this subject, my uncle said, 'As the delicate parts of any vegetable substances would be entirely destroyed if transported to a great distance by floods, it is evident, that those plants whose remains are found well preserved in a fossil state, must have been inhabitants of the countries where the strata were formed. This consideration has given rise to many interesting speculations on the former climate of Europe, and its apparent changes; but if mammoths and elephants were clothed with fur to enable them to endure a Siberian winter, why may we not suppose that there were also species of palms and tree ferns suited to our temperate regions? Another curious inference may be drawn from the examination of vegetable remains: those found in what the German mineralogists call brown coal, exhibit in their wood, in their fruit, and their leaves,

sufficient proofs of their belonging to indigenous, or, at least, to modern races of plants; while those which occur in what is termed black coal are all unknown or exotic: there can be no doubt, therefore, that those two coal formations belong to two very different ages of the globe.'


26th.—I still find a great deal of amusement in watching my little family of swallows. They are unwearied in collecting food for their young; skimming through the air from morning till night, and darting on their prey with the most sudden turns. They catch gnats and flies, and consume an astonishing number of mischievous grubs; and I am told they often accompany people on horseback through the fields, in order to pick up the flies which are roused from the turf by the horses' feet.

They never touch seeds; insects are their only object; and according to the weather, or the degree of warmth, they sometimes skim along the surface of the ground, and sometimes fly at a great height. When there is a scarcity of insects, they have been known to snatch the flies imprisoned in a spider's web, and sometimes even the spider itself.

Another species arrived soon after the chimney swallow, which, I believe, I have already described to you. It is called the house martin, or window swallow; but there is no end to the


number of names given to this bird. It is very like the chimney swallow, but it has no spots on the tail, and its feet are differently formed, for it has the power of turning the hind toe forwards, in order to cling to a wall. This species are chilly little creatures : when there is a cold wind or rain, they press close to one another, and are sometimes so benumbed as to be caught by the hand.

It is said that, after they arrive here in April, they play about for nearly a month before they begin their nests. Sometimes they build in the cliffs and rocks that hang over water ; sometimes against a perpendicular wall, without having any support underneath the nest ; and they show great sagacity in their mode of carrying on their work. While laying the foundations, they not only hold on by their claws, but they fix their tail against some little projecting roughness in the wall, to serve as a kind of prop ; and then with their bill they carefully cram mud and bits of straw into the smallest chinks in the face of the brick or stone ; and to give those materials time to harden, preparatory to a fresh layer, the prudent little mason only labours early in the morning, so that his work dries sufficiently in the course of the day. I have got up several times at day-break, to see how neatly he uses his bill as a little trowel, while he carries the mortar or clay in one of his feet. About half



an inch is laid every morning; and in ten or twelve days a hemispherical nest is thus formed, with an aperture at the top. The shell or crust is covered with rough knobs of earth; the middle is strengthened by the intermixture of straw; and the inside is nicely lined with grass and feathers, or sometimes with moss and wool. If by any accident the nest should be destroyed, it is rebuilt in a short time by the active help of many individuals, who unite to assist their distressed companion. For several mornings they persisted in rebuilding a nest at the passage-room window, which had been purposely torn down each day; but at last, after a hard struggle, they gave it up.

I understand that the *cliff* swallows of America—who place their nests close up to the jutting ledge of a rock, or to the eave of a house—most ingeniously arch the top, and make the entrance project out and turn downwards. Frederick, who mentioned that circumstance at dinner, very philosophically remarked that, while the population of Europe was steadily extending itself from the eastern shores of America to the western side of the Mississippi, those cliff swallows were as resolutely advancing in a contrary direction. ‘It appears,’ said he, ‘from C. Buonaparte’s “Ornithology,” that in ten years they had gradually established themselves in Kentucky and Ohio; in 1817 a single bird



was seen skimming round a tavern, near Lake Champlain—the next year, seven were observed there—the third year, twenty-eight—and in 1822, no less than seventy had arrived in April, which is the usual time of return from their migratory travels.'

The common sparrow sometimes seizes on a swallow's nest before it is completed; and having driven away its owner, adapts it to his own use; but such invasions are often repelled, after a spirited contest. This act of piracy has been frequently seen; but my aunt is inclined to doubt the truth of another story, though related by Linnæus, of a sparrow who took possession of a martin's nest, and obstinately resisted the united efforts of a group of these birds which had come to the aid of the owner; but at length they immured the intruder by building up the entrance with the same kind of mortar of which the nest was composed.

I can see the little swallows sitting all day with their heads out of the nest near my window, gaping for their parent, who comes frequently to them with food, and clings to the edge while they gobble it up; and I understand, that after they begin to fly, they are fed by their parents on the wing. I have watched for this, but could not perceive it—they are so quick in every movement. As soon as the first family are able to provide for themselves, they quit their home, and

while they are sporting about, and clustering and hovering round every building in the neighbourhood, the mother repairs the nest for a second brood.

27th.—The spring is now rapidly changing to summer, and the opening buds and unfolding leaves have been succeeded by a profusion of young branches and flowers. It is, indeed, very different from the rich luxuriant spring of your Brazilian climate; but, on the other hand, we have not here the perpetual rain, and the oppressive closeness of that season. The freshness of the air, the fragrance of the flowers, and the sweet song of the birds are all delightful; and every day I see some new and pretty insects. Though these insects are not quite in such numbers as, Humboldt says, appeared by turns, each at their different hours, on the Amazon river, still one may say—

Ten thousand insects in the air abound,
Flitting on glancing wings that yield a summer sound.

Just as we were looking at an uncommon butterfly to-day, Mr. Maude paid us a visit, and seeing how we were occupied, he told us that, when travelling in Switzerland last June, he witnessed a very curious circumstance, in the Canton de Vaud—an emigration of butterflies. He happened to perceive something flying past the windows, and on looking out he discovered

an immense flight of butterflies crossing the garden. He immediately went out, and found that they belonged to the species called, in French, *La belle Dame* ; they were all going in the same direction, exactly from South to North, turning neither to the right nor left ; people moving about the garden did not frighten them ; nor were they even tempted by the numerous flowers there to alight. Their flight was low and steady, but extremely swift ; and it continued in a column of several feet broad for more than two hours. As Mr. M. afterwards learned that these butterflies had been remarkably abundant near Turin, in April and May, he supposes that they had emigrated from Italy ; but, he says, naturalists have been greatly puzzled to account for their having done so in a body, because they do not belong to those species that live in societies.

He mentioned another singular circumstance. When he was on Mount Etna, he saw, to his great astonishment, an immense number of insects hovering over the dry lava of one of the old craters ; there was no appearance of vegetation, or of anything that could supply them with food ; but there they were in a thick mass, flitting about in the sulphurous vapour, which still rose from the crevices. The insect was a species of bug, or *cimex*.

Frederick took me this evening to a sunny *sand-bank*, to show me a great novelty, which

he had discovered there; the nest of the *mason wasp*. It is not common in England, and has never been found in this part of the country before. The nest is a round cavity, from two to three inches deep, which the insect bores through a hard sandy soil; and instead of throwing away the sand, as it is dug out, the little mason, by means of a glutinous fluid, forms it into oblong pellets, and arranges them round the entrance of the hole, so as to form a sort of cylindrical tunnel, which sometimes, Frederick says, is about two inches long. These little pellets are so nicely attached to each other, with regular spaces at the corners, that they have quite the appearance of fillagree work. It is said that the use of the tunnel is to prevent the incursions of ichneumons, and other artful insects, who are always on the watch to intrude their own young, and who are perhaps deterred by the artificial look of this entrance. One egg only is placed in the nest; and along with it are stored, as food for the future young, several fat grubs. But these are always full-grown, because, as they are just about to pass into the pupa state, they require no food for themselves.

Frederick opened the nest; and we examined it without fear, because the mason wasp having deposited its egg, and supplied it with food, does not remain to guard it. We found twelve grubs closely packed; each of them being coiled above

the other in a succession of rings, and the earth so pressed on them as to prevent their movements from injuring the egg. The remainder of the hole was filled up with some of the pellets that I have already mentioned.

28th, Sunday.—This morning my uncle proceeded to explain the Levitical dispensation. He began by reminding us of the gross corruptions, which had again crept into the Patriarchal dispensation, notwithstanding the awful warning of the flood.

‘But,’ said he, ‘even in those corruptions the main principle of that dispensation was preserved; that principle which marked the fallen state of man, and to which every hope of future pardon was necessarily attached. Instead of rejecting that doctrine of the Atonement, and the hope of the promised Deliverer, the apostates of that age made those points the very basis of their heresy. Their creed was built upon the necessity of expiatory sacrifices; and though they impiously divided and multiplied their herogods at pleasure, still each remotely signified the predicted seed of the woman supposed to be corporeally manifested in this, or in that illustrious human character. The Almighty, however, had declared that there should not “any more be a flood to destroy the earth.” In his merciful *councils* other means were adopted for counter-

acting the evil, and for reclaiming mankind from a depraved polytheism, in which the true belief would be altogether lost ; and with it the only means of ultimate reconciliation. The Patriarchal dispensation was no longer suited to this altered state of the world, nor sufficient for this gracious purpose ; it was, therefore, to be superseded by a new and intermediate dispensation, which should strongly inculcate the doctrine of the Divine Unity, and perpetuate and confirm, with unceasing light, from time to time, the true original doctrine of Redemption. Such was the object of the *Levitical* dispensation.

‘ The dispersion of the people at Babel had spread the corruptions of which they had been guilty, over the face of the earth ; and it pleased God to separate from them one family who were to be the depositaries of that peculiar principle which was to give efficacy to all religious duties. For this purpose, Abraham was selected from amongst the idolators of Babylonia, to be the father of a nation to which the new dispensation was to be committed. They were to preserve the true principles of religion for the rest of the world ; and from them that Messiah was to proceed whom they never ceased to desire, though they so strangely misconceived his real character, and debased the sublime object of his mission.

‘ The Patriarchal religion had been originally conferred on all mankind ; its principle was uni-

versality: but that being now changed, and a single people being chosen out of the corrupt mass, in order to preserve the truth, we may say that the chief distinction between the two dispensations was, that the first was *universal*, the second *particular*.

‘ The law, as delivered by Moses, and called the Levitical dispensation, because its ordinances were confided to the tribe of Levi, was not sent to do away the original religion, nor was it intended to supply new motives, or new sanctions. The law did not reveal the doctrines of the Divine Unity; or of redemption through a promised Deliverer; or of a state of future reward and punishment—for they had been already established; but to those great doctrines the law “was added, because of transgressions*.” It was *added*, in part, to preserve the knowledge of the Divine Unity in the midst of surrounding superstitions; in part, to preserve the doctrine of redemption amidst the idolatrous Gentiles; and also, by imposing on the Israelites numerous observances and restrictions, to preserve them separately from the world, a peculiar people; as Balaam said, “Lo, the people shall dwell alone, and shall not be reckoned among the nations.”

‘ But as the time drew near when the sun of righteousness was to rise, the characteristic of particularity began to be withdrawn from the

* Galatians iii, 19,

Levitical church. The light of the gospel was preceded by a faint knowledge of the truth which began to spread into other parts of the world. The Babylonish captivity left some traces of it in the East; the emigration of numerous Jews into Egypt carried it there likewise; and the translation of the Hebrew Scriptures into Greek opened the eyes of many pagans, so that several proselytes to the worship of Jehovah were received into the Levitical church.

‘Such were the preparatory steps to the abolition of paganism, and to the introduction of the last, and most important, of the three dispensations; that which was to do away with all other codes and rituals—which was to put an end to all emblematic sacrifices—and which was to collect into one fold, under one shepherd, all the nations of the earth.’

29th.—This evening I was talking away at a great rate to Caroline—probably a great deal of nonsense—and having frequently used the expressions, ‘I conceive, I imagine,’ my uncle at last asked me if I could explain the distinction between those two words.

I considered for a little while, and then said, that though I had been using them very negligently, yet I thought I could point out the principal difference.—*Conception* is the calling up an absent but distinct idea of something we have already perceived or felt—a complete picture in

the mind of some former sensation. But by *imagination* we take a bit of one of these pictures and a bit of another—we select different circumstances from a variety of things that we have seen—and by combining them together according to some particular view, we form a new creation, and obtain the idea of something that we have not seen.

‘Very well, my little Bertha,’ said my uncle smiling, ‘I like to see you exert your mind: but I would alter one part of your definition—I would not confine the imagination to objects of sight only; for though the mind dwells with greater facility on those that have been supplied by that sense, yet it is equally certain that our other perceptive faculties contribute their share also. The least imaginative person must recollect the many pleasing images which have been excited by the fragrance of distant fields, and the melody of unseen birds; and if you will accustom yourself to examine the process of your own imagination, you will find that an ample proportion of the subjects which pass through it are derived from all your senses.’

‘But, uncle, do you think that I have such a metaphysical head as to be able to discover what is going on in my imagination? A thought comes, and though it is easy to perceive the immediate circumstance that suggested it, I am sure my giddy mind could not trace it further *back than the first step.*’

‘ Whatever be the character of your mind,’ he replied, ‘ and whether you choose to observe them or not, those complex operations are habitually going on there; imagination rapidly selects from the materials presented to it by memory, and by its own creative power forms new trains of thoughts to pursue. The fine arts furnish innumerable instances of this process.— But imagination is not a simple effort of the mind:—tell me then, Bertha, if you can, what other intellectual faculties are engaged with it, besides conception, which you have rightly said only exhibits the simple objects of our former perceptions, and from which we are to make a fresh selection?’

‘ I believe, uncle, there is first that power which enables us to separate from our conceptions those circumstances which are not wanted for our purpose—the name is——’

‘ *Abstraction.* It is one of the most important of our faculties, and is not less necessary to our general conduct in life, than for the most refined intellectual pursuits. It helps us to remove the glare which often dazzles and deceives our moral perceptions; it reduces our complicated ideas to their constituent parts; and it presents us with the means of considering certain qualities of an object apart from the rest; and, therefore, of classing them with others; in short, it is equally subservient to the power of reason-

ing and to that of imagination. But go on, my dear—what next?’

There was something so encouraging in my uncle's manner of questioning me, that instead of frightening, it helped me to think. ‘Perhaps it is that which guides us in putting together the materials which we have been selecting;—or rather of arranging and suiting them to each other;—taste, I think.’

‘Right, Bertha: *taste* adapts and redispenses them in the best manner; and the more or less successfully as the *judgment* is more or less consulted. Without taste and judgment, the imagination would jumble them altogether at random, and would produce nothing but confusion and deformity. Paintings and poems may contain many beauties, and yet may totally fail in giving satisfaction; simply from the parts being ill-assorted—or, in other words, from a deficiency of judgment in their combination.’

‘But is there not another quality which is essential in a poet?—I mean, uncle, the power of catching the resemblance of ideas;—that which produces those beautiful allusions that form the ornament of poetry.’

‘You mean *fancy*—the power of quickly perceiving those delicate links which connect the most remote objects; and which, however slight, are sufficient for poetical analogies. The more sober analogies, which suit the province of

science, may be elicited by laborious reflection, or plodding perseverance; but fancy flashes them across the mind of the true poet, and, by a sort of inspiration, furnishes him with an exuberance of materials. But here again, Bertha, he must have recourse to taste and judgment, if he would make an agreeable impression on the minds of others. The ornaments of poetry, you say, are the allusions; but in order to please, the points of similitude must, on the one hand, be so obvious as to excite the immediate sympathy of the reader; and yet, on the other, they must be so disconnected as to display ingenuity by their comparison or contrast, and to surprise with their novelty.

— Hope and fear, alternate, sway'd his breast,
Like light and shade upon a waving field
Coursing each other, when the flying clouds
Now hide, and now reveal the sun.

‘ I think the conditions I laid down are both completely satisfied in these beautiful lines from one of Home’s tragedies. But if poetical allusions were merely employed for ornament, they would cloy the taste and encumber the sense—they must therefore help to illustrate and give force to those ideas that would otherwise be obscure, or which would be too rapidly passed over by the reader. For this reason they are generally taken from material objects with which our senses are most conversant, and are applied by

the fancy to those parts of intellectual or moral subjects which require illustration, and on which the mind is invited to pause.'

Caroline concluded the conversation by repeating Warton's lines on Fancy.

Waving in thy snowy hand
An all-commanding magic wand,
Of power to bid fresh gardens grow
'Mid cheerless Lapland's barren snow;
Whose rapid wings thy flight convey
Through air, and over earth and sea,
While the various landscape lies
Conspicuous to thy piercing eyes.

30th.—It is curious, that it has never been ascertained what becomes of swallows when they disappear in autumn. Some naturalists have supposed that they retire to hollow trees, old buildings, or caves, where they remain in a torpid state during the winter; while others affirm that they lie at the bottom of lakes and ponds. This last, my uncle says, is a most extravagant idea, for nothing can be more certain than that they would decay there in a short time; besides it is well known that they moult or change their feathers early in the year, and no one can imagine that this can be accomplished while they are torpid and under water.

Facts, however, have not been wanting, to support both these opinions; numbers certainly have been found in old dry walls and cliffs, and several were taken out of the shaft of an aban-

doned lead mine in Flintshire, clinging to the timbers, and apparently asleep. They were startled by a little sand being thrown on them, but they did not attempt to fly or change their place ; this happened about Christmas.

For the watery system, Kalm, the traveller, is a decided advocate : my uncle showed me a part of his *Travels in America*, in which there is a good deal on this subject ; but I must say it does not clear up my doubts. From Spain, Italy, and France, Kalm admits that they remove to warmer climates ; but in England and Germany, he says they retire into clefts and holes of rocks, and in cold countries immerse themselves in the sea, or in lakes. He gives several instances of their having been found in this state in Prussia ; but, even by his own account, it does not appear that they could have been to any depth in the water—for all those which he mentions were caught with a net among the reeds and rushes growing on the borders.

‘ Besides,’ said my uncle, ‘ as they are lighter than water, they could not sink, even if they tried to do so ; and as the lungs of birds differ very little in their structure from those of quadrupeds, it is quite incredible that they could live for several months, or for several minutes, under water. Even diving birds come up exhausted, and would be drowned like any other animal, if retained under water beyond a certain

time. Swallows and martins, indeed, sprinkle and splash themselves as they glide along the surface, but they never dip completely into the water for a single moment. At the season when they disappear there is no want of their insect food in the air; nor have any of those cold blasts come, which, at a later period, would benumb them; what, then, could induce them, particularly the young birds who have just begun to enjoy the use of their wings, to take a dreary plunge into a pond? Cold and scarcity may drive some animals to hibernate, like your little dormouse, Bertha; but I am satisfied that the whole tribe of swallows fly off, like other birds of passage, to distant countries.'

'To what countries?' I asked him.

'It is probable,' he replied, 'that there is some general temperature that suits them best, or that is most productive of those insects on which they prey; and as the seasons change, that temperature can only be obtained by approaching the equator, or, perhaps, by passing into a corresponding latitude of the Southern hemisphere. A circumstance mentioned by our friend Colonel Travers, made a strong impression on me:—when he was going up the Mediterranean, I think in the latter end of April, a great number of swallows settled on the yards and rigging of the ship: they began to alight there about sunset, and before nine o'clock some thousands had

collected ; but in such an exhausted state that they immediately went to sleep, and allowed themselves to be handled without making any attempt to escape. At daylight next morning they rose, as if by a single impulse, and flew away to the northward ; and several prodigious flights of the same bird were observed, at a great height in the air, pursuing the same course towards Europe.

‘ Poor creatures,’ said Frederick, ‘ they must have come all the way from the north coast of Africa. Can you tell me, father, in what part of the Mediterranean this happened, that I may measure on the map the distance they had flown ? ’

‘ I do not recollect,’ said my uncle ; ‘ but if I am right in my ideas of their swiftness, the widest part of that sea would be the affair of a few hours. It has been estimated that a swallow usually flies a mile in a minute ; and sixteen or seventeen hours daylight will give about a thousand miles for a single day’s journey at that velocity. Now when you recollect that here we see those birds continue on the wing the whole day without the least appearance of being tired, we can only account for the extraordinary fatigue of those which perched on the Colonel’s ship, by supposing their flight to have continued for several days ; and thus three or four days’ exertion might have brought

them from a country bordering on the southern tropic.'

I reminded my uncle of the account we had lately read in Dr. Brewster's Journal of Science, about the rapid flight of the wild pigeons that cross America in search of food.

'Yes,' said he, 'and there is a curious fact recorded in that paper, which satisfactorily demonstrates, that the sustained velocity with which some birds remove from one district to another, in search of food, is not confined to the instinctive energy which belongs to the time of annual migration, but that it is their habitual and daily practice. The circumstance to which I allude is this:—pigeons have been killed in New York, whose craws were still filled with fresh rice, which must have been collected in Carolina; and, therefore, as the pigeon digests its food very quickly, they could have been but a few hours performing a journey of three hundred miles. But we need not go so far off for examples of the ease and rapidity with which pigeons go to great distances in quest of some favourite food; for it is well known, that in the vetch season in Norfolk, the Dutch pigeons come over in the morning, and return to Holland in the evening.'

Mary showed us a passage in the voyage of La Pérouse, which proves that swallows do go a *long way to the southward*. 'A swallow of the

common species, undoubtedly lately come from Europe, followed us for some time without alighting on the vessel, but soon directed its flight towards the African coast, where it was sure of finding the insects on which it feeds. We were in 28° N. lat., and 22° W. long. Adanson also asserts, that he witnessed the arrival, on the coast of Senegal, on the 6th of October, in the evening, of real European swallows; and he ascertained that they are never seen there but in autumn and winter.

My aunt has often observed them collected in large companies on trees, and on the roofs of houses, previous to their flight in September; and the direction they take at that season is to the southward.

My uncle then told us, that his old and highly respected friend, Dr. Jenner, who, you know, lived just on the other side of the Severn, used to remark, that if swallows really did creep into holes and crevices to hibernate, they would surely appear in a languid state when they came out again—in the same way that all those quadrupeds who pass the winter in a state of torpor, are very much emaciated when they revive. The hedgehog, for instance, at the approach of winter, retires to its nest covered with fat, which is entirely absorbed when it awakens on the return of spring; whereas when the swallows appear in April, they are plump and strong upon the wing.

Mary added, that swallows have two broods during the summer, and that she had somewhere read, that it was only the strong early brood that took flight to warmer regions; but that the young birds hatched late in the year, being incapable of distant migration, seek shelter in holes and hollow trees, and wherever they can lurk in safety in the winter.

Mary afterwards showed me a passage about swallows in Latrobe's Journal, a book which I have more than once mentioned to you. He writes from the settlement of Groenkloof, to the north of Cape Town.

' Every morning I am greeted by the pleasant chirping of two swallows, which have a nest in the corner of my room, under the ceiling. There is hardly a room, kitchen, or outhouse, in the country, without these inmates, and it would be thought next to murder to kill them. They build their nests of clay in the shape of a bottle; they line them with the softest down, and though they leave the country during the winter, the same birds always return to the same nests after their emigration. As the room doors usually stand open in the day, they go in and out whenever they please; but if the door is shut, they give notice of their wish to go abroad, by a gentle piping and flying about the room; and no one thinks it troublesome to let them out: indeed, I have *often left my bed to open the door for them.*'

I forgot to mention that my uncle told us there was no country in the world which was not visited by these little swift-winged creatures. They were seen, for a short time, even in the frozen regions of Baffin's Bay and Melville Island ; and Captain Franklin says, they made their first appearance at Great Bear Lake in the middle of May, to feast on the mosquitoes and other insects that abound on the northern shores of America. Wentworth says, they may be literally called cosmopolites.

31st.—After dinner yesterday, the conversation turned on the importance of the palm tribe in their native countries to the inhabitants. Sago, cocoa-nuts, dates, oil, and various other articles of excellent food which they produce, were all discussed ; and each of us mentioned some of the many uses to which the stems, the leaves, and the fibrous parts were applied. Miss Perceval afterwards endeavoured to explain the botanic distinctions between palms and tree-ferns, which have so many points of resemblance in their mode of growth : but my aunt suggested, that her description would be much more interesting if we were looking at the plants ; and she kindly proposed another expedition to those magnificent stoves of Lord S., that we had seen with so much pleasure last autumn.

Miss P. approved of this arrangement, and she has been exceedingly gratified to-day with all she

saw ; but none seemed to be more delighted with our visit than the old gardener. He perceived how well she could appreciate his difficulties and his success ; and he listened with the greatest attention to all her remarks. Miss P., however, did not forget the circumstance that led to our visit, and she shewed us in several different palms, that the scales of the foot-stalks completely sheath the stem ; and that after the decay of the leaf they form an entire ring, which has a very different appearance from the separate marks or cicatrices left by the fronds of the fern.

She had never seen so fine a collection of palms in this country ; and she told us many circumstances of their history and habits. She made us observe, that in the leaves the fibres run parallel to the edges. There are two grand forms to which the leaves may all be referred ; pinnated, as in the cocoa and date ; and fan-shaped, as in the dwarf and fan-palms. In the dwarf which we examined, the breadth of the leaf is considerable, but from the direction of the fibres, and the manner in which it is folded, previous to development, it may rather be regarded as composed of several leaves.

The flowers of palms are even more numerous than I thought, though I remember, at Rio, trying in vain to count those of the *alfonsia amygdalina*—it would have been a hopeless work, for Miss P. says one spathe sometimes contains sixty thousand.

Some palms are gregarious, forming large woods, and naturally spreading over whole districts; as the dwarf palm does in the South of Europe. She says, that the different species are never much intermixed; though their districts are small, they are generally distinct from each other. It is remarkable that no palm of the old world is found in America, except the coconut and the oil-palm of the coast of Guinea; and that there is but one species common to Asia and Africa. The palms of New Holland, also, are peculiar to that country; and I believe that she said, those of the Mauritius only occur in those islands. The cocoa, the date, and the sago palms, are the most widely distributed; but the true home of the palms is the torrid zone; for, of one hundred and ten well-known species, only twelve are found outside the tropics.

I asked Miss P. whether the leaves which are found lining the tea-chests belong to a palm. Certainly not, she said, nor to any of the cane families, as is evident from the want of a midrib; it is generally believed that they belong to some of the grass tribes, and indeed very closely resemble the broad-leaved *pharus*.

My uncle pointed out to her several large and flourishing plants of the *ficus elastica*, or caoutchouc tree. They have succeeded so well for the last two years in a stove kept at a very low temperature, that some of them are now removed

to the green-house, and even one or two are put out of doors. As we drove home, I asked my uncle at what time caoutchouc, or Indian rubber, was brought to this country.

‘ It appears,’ said he, ‘ to have been first introduced into Europe, about the middle of the last century ; and is, I am sure you know, procured from two other South American plants, as well as from the ficus ; I mean the *hævea*, now called *siphornia*, and the *jatropha*. The juice, which is obtained by an incision in the bark, is made to spread itself in successive layers, over clay moulded into the form of a bottle, and when sufficiently thick, it is hung over the smoke of burning wood, which hardens, and gives it a dark colour : the clay is afterwards crumbled and thrown out. It is fabricated, by the inhabitants of its native country, into vessels to contain water and other liquids ; and it is in some places used by the fishermen for torches.

‘ Caoutchouc is also procured from a climbing plant, *urceola*, a native of Sumatra. If one of its thick old stems be cut, a white juice, like cream, oozes out ; by exposure to the air, a decomposition takes place, and while part of it concretes, a thin whitish juice is separated. Cloth, well covered with this juice, becomes impervious to water ; and the pieces so prepared are easily joined together by applying fresh juice to the edges.’

I asked my uncle, on our road home, if it was by means of that juice that the waterproof cloth, which he had seen in London, was prepared.

He answered, that he had seen some of the juice at the Royal Institution, where it had been brought from Mexico to be analysed ; but that, in general, caoutchouc was imported in a solid state. ‘ A cheap method,’ he continued, ‘ of dissolving it was discovered by Mr. Mackintosh ; and his mode of applying it to cloth, linen, silk, or any materials of that kind, was equally ingenious and useful. When reduced to a fluid state, a sufficient coat of it is laid upon the cloth, and another piece being then spread over it and pressed together, they become permanently united as well as waterproof ; but as the outside and the inside need not be similar, you may have the one of cloth and the other of velvet ; or a camlet cloak lined with silk, or any other combination you please.

‘ There are many other purposes to which this contrivance has been applied. *Hoses* for conveying the water from fire-engines, when made of canvass and caoutchouc, and without seam, are much stronger, more durable, and more flexible than those made of leather. I have been told by a naval officer, that a hose of this sort affords an excellent mode of filling the casks in a boat, from a well or stream near the shore, when a

heavy surf prevents their being landed ; for it is obvious that such a hose may pass through the sea, without the possibility of the fresh water it conducts being tainted by the salt. It is also well adapted to tilts for wagons and hay-ricks ; it would make admirable military tents ; and you may imagine what a comfort waterproof bags must have been in Captain Franklin's expedition to the Polar Sea, in keeping the men's clothes dry, notwithstanding the dismal weather to which they were so often exposed.

‘ There is only one more use which I will now mention. Any substance that is carefully coated with this gum is as impervious to air as to water : bags, therefore, made in the shape of cushions or pillows, which can be folded up and carried in the pocket, may be in a few moments inflated with the breath by means of a small pipe ; and even beds, which, when empty, would occupy but little room in a portmanteau, would often preserve the health, and greatly add to the comfort of travellers in certain countries, where a dry, clean, and soft bed is an unattainable luxury.’

Miss Perceval told us that in some of the forests of Guiana, a substance called *dapicho* by the Indians, is found in large masses under ground ; and which, having all the properties of the recent gum, was long known by the *name* of fossil caoutchouc. But the indefati-

gable Humboldt, having at last succeeded in finding some of it undisturbed in the ground, at once perceived that it had oozed out of the roots of caoutchouc trees which were so old that the interior had begun to decay. It is white and brittle till exposed to a strong heat ; and when sufficiently beaten with a heavy club, it acquires great elasticity. The Indians make their famous tennis balls of it ; it is also cut into corks, which are very superior to those made of the cork tree ; and it is worked up into enormous drum-sticks—the drum being merely a hollow cylinder of wood about two feet long.

‘ There is, however,’ my uncle observed, ‘ a species of fossil caoutchouc. It is, in fact, a bitumen, but flexible and elastic ; and, as it has the property of cleaning off pencil-marks in the same manner as Indian rubber, it has been named mineral caoutchouc.’

I asked him if it might not be some of the dapicho, which had lain buried in the ground, long since the trees, from which it oozed, had perished ?

‘ I have but two reasons, Bertha, to oppose to your theory. It is only found near Castle-town in Derbyshire, and you know the English climate is not very well suited to those trees—and secondly, it is in the deep recesses of a lead mine, surrounded by spar and limestone.’

June 1st.—You may remember, Mamma, how much I was interested, last year, by my uncle's illustrations of the Mirage and the Fata Morgana. The subject was often afterwards alluded to in conversation; and my aunt having incidentally mentioned it to her charming correspondent in Upper Canada, I was this afternoon agreeably surprised by her reading aloud the following passage in a letter which she had just opened:—

'Your young friend Bertha will be pleased to hear that last June I witnessed something very like that curious phenomenon which you say interested her so much. One morning I awoke just at the break of day, and accidentally directing my eyes to the window, which has a southern aspect, I was astonished to see—instead of the black monotonous forest by which we are surrounded—a wide, magnificent sheet of water, connected with a spacious river, winding to a great distance, and confined by gentle slopes and grassy banks; and all this so distinct, that the bright fresh green of the young leaves was beautifully contrasted with the dark foliage of the pine woods.

'I rubbed my eyes, and looked again—for it appeared to be exactly our lake near Peterborough, with the Otanabee River winding towards Rice Lake, except that the whole view *was* reversed. I wondered how all this could

be seen over our lofty trees, and I went to the window and leaned out to look for objects which I knew—but nothing was to be seen except my beautiful and inexplicable landscape, I lay down, and still saw it from my pillow;—but my eyes gradually closed; and, when I again awakened, heavy mists had risen with the sun—and my fairy prospect had vanished.

‘ I now recollected the description I had long ago read of the *Fata Morgana*, and I was satisfied that this was no vision of my fancy, but the reflection of real scenery upon some peculiar vapour which only appears at that early hour of the morning.’

2nd.—I spent a great part of this morning in examining the ingenious leaf-nests of some little caterpillars, which Mary says are the larvæ of the *tinea* moths. She explained to me their construction. The caterpillar fixes a number of fine silken cords from one edge to the other of the leaf, and by pulling at them with its many strong feet, the sides are gradually forced to approach each other till they meet, when it fastens them together with short threads. Sometimes the large nerves of the leaf are too strong to yield to these efforts, and the clever little creature immediately weakens them by gnawing them half through in different places. I could distinctly perceive those places in several of the

leaves which we opened. Some species cut out a long triangular portion from the edge of the leaf, and form it into a conical roll, like a paper of comfits; in one spot, however, they let it remain attached to the leaf, by way of a base, and then, by fastening little cords to the points of the cone, it is actually pulled upright on the remainder of the leaf, where it stands like a tent. But there are other tineæ which show still more dexterity in constructing their habitations. Some of them we found on the under sides of the leaves of the rose-tree, apple, elm, and oak; and Mary made me observe how nicely they form an oblong cavity in the interior of the leaf, by eating the pulpy substance between the two membranes composing its upper and under sides. The detached pieces are then joined with silk, so as to make a case or horn, which is cylindrical in the middle, with an orifice at each end, the one being circular and the other triangular; and the seam is so artfully made, as to be scarcely perceptible even with a glass. Were this case all circular, it would be more simple; but the different shape of the two ends renders it necessary that each side should be cut into a different curve.

But I should fill my whole journal, were I to tell you all the beautiful contrivances of these insects, and the instinct, or, I might say, the *reason which appears in all their contrivances.*

3rd.—My uncle mentioned yesterday, that in returning a few years ago from Berwick-upon-Tweed, he was much surprised, as night came on, at seeing two immense fires near Newcastle. Upon inquiring, he found that they were the small coal which does not readily sell, and is therefore separated by screens from the larger blocks. Prodigious heaps are thus formed at the mouths of the pits ; and from the decomposition of the pyrites, they take fire, and continue to burn for years. One of these huge mounds was but a few miles from the road ; it was said to cover twelve acres of ground, and to have been burning for eight years.

As all that small coal might be made use of to produce coal gas, he says the legislature should interfere to prevent such a shameful waste, for not less than one hundred thousand chaldrons are thus annually destroyed on the banks of the River Tyne ; and nearly the same quantity on the Wear. Beneath these burning heaps, he found a bed of blackish scoria, which resembles basalt, and which is used for mending the roads.

To the west of Dudley, in the great Staffordshire coal district, my uncle says that some of the collieries took fire spontaneously many years ago. The subterraneous conflagration spread to a great extent, and produced some singular effects ; smoke and steam were seen to rise from

the earth, the vegetation appeared to be hastened by the heat, and even the ponds were warm. What was still more remarkable, where the ignited part of the coal came near the surface, the argillaceous strata (or potter's clay) covering it have been converted, by the intense heat, into a species of porcelain jasper, which is sometimes beautifully striped ; this last circumstance being caused by the various degrees of oxidation of the iron that is contained in the clay.

4th, Sunday.—This morning—perhaps the last Sunday that we shall spend at Fernhurst for many months—my uncle finished explaining to us the three dispensations ; and it made the more impression on me, as I fear that, on our journey, we shall not have any of those regular Sunday conversations, which have been so instructing and satisfactory.

‘ The object of the Christian Dispensation,’ said he, ‘ was to ratify the promises of redemption and of eternal life, through the merits of a divine mediator. What the former dispensations announced as *to come*, this concluding dispensation has exhibited in actual accomplishment. The long-expected Redeemer has been manifested ; he has made the promised atonement for the sins of mankind ; he has

shewn himself as the mediator of the new covenant, and the doubts of ages have vanished before the light of the Gospel.'

I ventured to interrupt my uncle, to ask why it is called the *new* covenant, as if it was of a different nature from the two former ones.

'It is so styled,' he answered, 'not as being new in its nature, or different from those which preceded it; but merely as being new, or last in order, and therefore superseding all others. The typical sacrifices of the two former were, you know, the symbols of the real victim who consummated the Christian covenant. In each of them provision was made for the reconciliation of fallen man; and the object of each being the same, the terms were the same: Jehovah graciously promising on his part to accept the meritorious death of the Messiah, as a full acquittal and satisfaction of all sin; but, on the two-fold condition, of faith and of obedience on our part.

'The doctrine of atonement through the sufferings of the Mediator forms the basis of each of the covenants, and is justly considered, by all those who take their religion from Scripture, as the corner-stone of the Christian dispensation. The proofs of this essential tenet are as numerous as they are clear and explicit; and, in the last discourse which our Saviour held with

his disciples, and which is fully recorded by St. John, you will find it very distinctly stated.

‘A being of that transcendent dignity who could say, “All power is given to me in heaven and in earth,” would scarcely have been sent for the mere purpose of communicating a clearer knowledge to mankind of their duty, or of setting before them an example of practical holiness. These, no doubt, were among the objects for which the Son of God became man; but they were only collateral objects. In order to appreciate the importance of his mission, we must compare it with the modes adopted on former occasions. When the corruption of mankind drew down the dreadful chastisement of the deluge; and when, after that catastrophe, the patriarchal covenant was renewed, and fresh blessings and privileges were offered to the posterity of the second father of mankind, the only communication of these signal events was announced through Noah. When God vouchsafed the second covenant, and established the Jewish religion by direct revelation, a mere human agent, Moses, was employed. And when the idolatries and wickedness of the Israelites induced the merciful Governor of the universe to interfere, Elijah, and other mere prophets, were sent to reclaim them.

‘If, therefore, when Christianity was revealed,

the only intention had been to prescribe a purer mode of worship, and to withdraw mankind from their vicious career, why should not that mission have been entrusted to another prophet, instead of requiring the special interference of the Son of God?—Still more, if no other purpose was to have been accomplished by the coming of Christ, why was it ordained that he should suffer death, in attestation of his doctrines? Noah died a natural death; so did Moses, full of years and honour; and Elijah was distinguished by the privilege of not dying at all. From this comparison alone, we might safely infer, that the sufferings of our Saviour were connected with some other momentous object—and in all parts of the Scriptures we find that object declared in the most express terms. I will point out to you a few passages which cannot be mistaken or perverted.

‘ “He was wounded for our transgressions; and the Lord hath laid on him the iniquity of us all.” “He was made an offering for sin.” “He taketh away the sins of the world.” “If any man sin, we have an advocate with the Father, Jesus Christ.” “Christ, our passover, is sacrificed for us.” “We have redemption through his blood.” “The Son of man came to give his life a ransom for many, a ransom for all.”

‘ These passages solve that great enigma, and explain, in the most distinct language, the sub-

lime and merciful object of the Christian dispensation. And now let me ask you all, what are the impressions with which this view of it should fill our hearts? Should we not be overwhelmed with the magnitude of the mercy; and eager to exclaim with the Psalmist, "Lord, what is man, that thou so regardest him!"

'But in thus summing up the proof of this mysterious plan of redemption, it is highly necessary to remind you, that it is *conditional*; that salvation is offered to you, not forced upon you; and that it is offered solely on the terms of implicit submission to the commands of our Redeemer. If you reject the Gospel; or if, persuading yourselves that you believe in its truth, you allow your actions to be in contradiction to its precepts; or if, in cowardly subservience to the fashions of the world, you seem ashamed of your Mediator and Substitute, then you can claim no share in his ransom. My dear children, the alternative is fairly set before you, and you must make your own choice.'

Mary asked her father whether this third dispensation did not materially differ from the Levitical, in its again embracing *all* mankind in its offered benefits.

'Yes,' said he, 'like the Patriarchal dispensation, it is universal in its object. Christianity is, in fact, but the completion of Patriarchism; the law having been a connecting

chain between them. Under the Patriarchal dispensation all men were taught to look forward to the promised Deliverer; under Christianity all men are taught to rejoice in the actual appearance of that promised Deliverer, who has done and suffered everything that was predicted of him.

‘Christianity has not yet become universal; but the purpose of the Almighty is still powerfully though silently working. In the appointed time, “the earth shall be full of the knowledge of the Lord,” and the Messiah will be universally acknowledged by Gentiles, Jews, and all nations. “Thus from first to last, under the Three Successive Dispensations,” has God carried on one consistent and harmonious scheme of grace and mercy for the salvation of his fallen creatures.’

5th.—This evening, in talking of the variety of representations that different historians give of the same facts, my uncle was lamenting the loss of the many ancient works which are alluded to in contemporary authors, but which appear to have perished; and he particularly regretted the 105 books of Livy’s Roman History, which originally consisted of 142.—‘But,’ he added, ‘there are some hopes that they may yet be recovered.’

Mary asked him if there was any chance of

their being found among the Herculaneum manuscripts?

‘Very little indeed,’ he replied. ‘When those famous rolls of papyrus were disinterred nearly eighty years ago, great expectations were formed of the literary riches they might contain. Their original number was 1700, but by far the greater part were found, on closer inspection, to be so mangled, that there was not the least probability of recovering any portion of their contents. Of those that were in a better condition, many were destroyed by the first awkward attempts to unroll them; and, unfortunately, the remainder have suffered great additional injury from long exposure to the air.

‘I should have thought,’ said Wentworth, ‘that having been partly charred by fire, they would be proof against air and damp; as we find old stumps of charred gate posts in the ground, which seem to have remained there an immense time, perfectly unchanged.

‘Your reasoning,’ replied my uncle, ‘would not apply to this case, even if the papyri had undergone the action of fire, because it is since their exposure to the atmosphere that they have suffered. They have, indeed, all the appearance of charcoal, even the sticks on which they are rolled; and it was therefore very naturally supposed that this effect had been produced by

the heat of the lava which overflowed that devoted city ; but Sir Humphry Davy has proved, that they were protected from the heat by a thick bed of sand and ashes, and, in his opinion, their charred appearance has been the result of a gradual process of decomposition.'

'What means, uncle, could be taken to unfold and read manuscripts that were in such a state? Surely all the characters must have been effaced!'

'No, not quite : the characters are seen black and shining upon the black but not shining surface ; just in the same way that a letter sometimes appears after we have burnt it, the traces of writing being still visible on the gauzy substance, while it flickers about in the smoke at the back of the grate. To unrol them, many ingenious contrivances were invented ; that which I saw, when at Portici, and which, I believe, has been generally adopted, is to glue some thin flexible material to the back of the papyrus, and then to raise it gently by a number of threads, while the folds are at the same time carefully opened by a pin. In this way a few of the most perfect have actually been restored and published ; but, to the great disappointment of the world, they are works of no value. One is a treatise on the inutility of music, in Greek ; a few pages of a Latin poem, and some other fragments, but all equally uninteresting. One of the

chief difficulties arose from the adhesion of the folds, as if they had been gummed together; and, to conquer this, Sir Humphry applied the resources of his profound chemical knowledge. He exposed some of the fragments to the action of chlorine, and to the vapour of iodine, and succeeded, to a considerable extent, in loosening and detaching the folds; but the jealousy of the Neapolitans prevented his further progress, and he left them to pursue their own plans. Unfortunately, the best specimens were operated on long ago; and those that now remain are in too mutilated a state to afford much hope for the future.'

'But,' said Caroline, 'as they are rapidly unburying Pompeii, perhaps some manuscripts may be found there, and in a much more perfect state; for Pompeii was covered with mud and ashes, and not with burning lava, like Herculaneum.'

'Several rolls of papyrus,' my uncle replied, 'have been already found in the houses of Pompeii, but all in a far worse condition than those of Herculaneum—having nearly the appearance of the white ashes produced by burning common paper.'

'Then, uncle,' said I, 'to what quarter do you look for the lost books of Livy?'

'To the vast collections of vellum manuscripts,' he answered, 'which have for centuries

been accumulating in public and private libraries. It has been discovered, that many of these have been twice written upon, and some even three times. In the middle ages the art of reading and writing was almost entirely confined to the monks ; and all true taste for literature being suspended, it was natural that they should consider the finest effusions of the ancient poets, or the most important records of profane history, as of little value, in comparison with the statutes of their own order, or the histories of their general councils. It appears, therefore, to have been a common practice of those times, to expunge the writing on the parchment manuscripts in their possession, in order to substitute copies of those works which they estimated so much more highly ; and in some instances the former characters have been discovered, and successfully traced.'

' But, papa, if the original writing was expunged, how is it now legible ? ' Frederick asked.

' The ink,' said my uncle, ' in general use among the ancients, was merely a mixture of lamp-black and gum ; and as that did not sink into the parchment, a wet cloth in the hands of a monk did the business as effectually and finally as your sponge, Frederick, annihilates your most elaborate calculations from a slate. But the injury to which writing with such ma-

terials was liable, from damp and other accidents, had been long known, and various expedients were adopted to provide a remedy. Pliny says it was difficult to efface ink which had been made with vinegar; and it appears, that at a later period some preparation of iron was added for the same purpose, as both of these ingredients sink into the parchment. In either of those cases, the lamp-black, or colouring matter, could be only partially removed by washing; so that it was necessary to scrape the surface, in order to obliterate the characters, or to rub it with pumice-stone, in the same manner that it had been originally prepared for writing on; and to such a parchment or manuscript the name of *palimpsest* was given, from a Greek word signifying twice scraped. But though the process that I have described apparently removed the writing, it could not draw out the infusion of iron which had been absorbed by the parchment; and as you all know that ink is nothing but a combination of iron with a solution of *galls*, it will readily occur to you, that by applying that solution with a light brush to any of the palimpsest manuscripts, the original writing would be revived,—provided there had been any iron in the composition of the ink.

‘What a beautiful discovery!’ exclaimed Caroline. ‘And when generally known, how zealously will all our antiquaries attack the

hordes of manuscripts now dormant in the public libraries !'

' Yet,' said my uncle, ' it is not a new discovery : the celebrated Montfaucon endeavoured to draw the attention of the learned world to these palimpsest parchments just a century ago ; but antiquaries are not put into zealous activity quite so easily as you imagine. In that long interval, nothing very material seems to have been effected, till the present accomplished librarian of the Vatican devoted himself to the subject ; and the success with which his efforts have been already crowned, more than justifies the sanguine hopes which I expressed. Other industrious labourers are also in the field, and what has been already achieved is only a pledge of the rich harvest that will distinguish this age.'

6th.—In conversing about our approaching journey, and the fine mountainous tracts that we are to see in Wales, Wentworth asked the meaning of the word *pen*, which is prefixed to some of the Welsh names, as Pen-man-mawr, for instance.

' It is an old British word,' my uncle told him, ' signifying head or summit ; and it is joined to the names of several of those hills, amongst the inhabitants of which much of that ancient dialect is still to be found.

‘ It is singular that this term appears to have been used in the same way among the Romans ; for we find that the crest of the Alps near Mount St. Bernard was anciently called *Alpes Peninæ* ; and that the very same name was also applied by them to the central chain of mountains which extends from the borders of Scotland to the middle of Derbyshire. This Penine chain traverses the great northern coal district ; and many of its hills retain the old British term pen, as Penygent, Pendle Hill, &c.’

‘ There are several wild and very picturesque views,’ said my aunt, ‘ in that Penine chain ; and its caverns, precipices, and torrents, have all a singular character, particularly the sublime and curious scenery of *The Peak*. I am sure, Caroline, you recollect a beautiful description of the banks of the Greta, in Yorkshire, in your favourite poem of *Rokeby*.’

Caroline immediately repeated these lines—

Broad shadows o'er the passage fell,
Deeper and narrower grew the dell ;
It seem'd some mountain, rent and riven,
A channel for the stream had given,
So high the cliffs of limestone grey
Hung beetling o'er the torrent's way,
Yielding along their rugged base
A flinty foot-path's niggard space ;
Where he who winds 'twixt rock and wave,
May hear the headlong torrent rave,
And like a steed in frantic fit,
That flings the froth from curb and bit,
May view her chafe her waves to spray
O'er every rock that bars her way.

‘ I have lately read two facts,’ Mary said, ‘ which show the depth of those remarkably abrupt ravines that intersect the craggy mountains in the moorlands of Staffordshire. In Narrowdale the sun is never seen by the inhabitants for the three winter months; and even when it is visible, it does not rise to them till one o’clock in the afternoon. The other circumstance is this—at Leek, the sun, at a certain time of the year, seems to set twice in the same evening; for, after it sinks beneath the top of a high intervening mountain, it again breaks out from behind the steep northern side before it reaches the horizon.’

7th.—My uncle showed me to-day a hard black substance, of very close grain. I did not know what it could be, for it evidently was not coal nor flint. He told me, that the soil which covers the great northern coal-field appears to be alluvial, and that it contains masses of all the different rocks that compose the whole district; and among them, portions of this hard black *basalt* are found everywhere in abundance.

‘ I show you this,’ he said, ‘ because the ancient inhabitants of Britain formed the heads of their battle-axes, which are commonly called *celts*, from this stone. They resemble in shape the tomahawks of the South Sea islands. Barbed arrow-heads, neatly finished, and made of pale-

coloured flint, are also frequently picked up on the moors, and are called *elf-bolts*.'

I asked if those things were often found in other parts of England, as they must be very interesting in tracing the history of our early ancestors.

'Yes,' said he, 'in all parts of Great Britain; and not only weapons, but various utensils; besides other articles, of which the uses have not been ascertained. For instance, at Kimmeridge, on the coast of Dorsetshire, where there are beds of a kind of stony coal, there has been found on the tops of the cliffs, what the country people call "*coal-money*." The pieces are round, and about two inches and a half in diameter, by a quarter of an inch in thickness; one side is convex, with mouldings, and the other is flat and plain, but with two, or sometimes with four small round holes in the surface. They are, in general, two or three feet below the surface, inclosed between two stones, set edgewise, and covered by a third; and the bones of some animal are always found along with them. A little deposit of this coal-money was also discovered in a shallow bowl of the same material.'

'And was coal ever really used as money, uncle? It would make rather a bulky currency.'

'Some people imagine that they were amulets;

others, that they were connected with the ancient Druidical rites ; and many suppose them to have been coin. Perhaps the cant or vulgar expression, “down with your coal,” which means “pay your money,” may assist you in choosing which of these hypotheses you like best.’

8th.—The back gate of the garden is not often unlocked, and to-day when the gardener was going to open it, the key-hole appeared to be so stopped up, that he took off the lock, and finding a little nest in the inside, he brought it to my uncle.

It proved to be the nest of a species of bee called *apis manicata*. The cells are formed of two or three layers of a silky membrane, which seems to be composed of a kind of glue secreted by the insect ; it resembles gold-beater’s leaf, but so thin and transparent, that you can distinguish through it the colour of the smallest object. As soon as each cell is completed, I am told that the bee deposits an egg in it, and then nearly fills it with a mixture of pollen and honey ; and so proceeds till all the cells are finished and filled. As the situation is rather cold for the grubs, we found the cells plastered over with the same composition, and even a warm outer coating of wool was stuck to this paste to preserve them from any change of temperature. The wool appeared to be the down of some plant ; and my uncle says,

they have been observed to scrape the down from the leaves of the woolly hedge-nettle, and the common rose campion, with their mandibles ; while with their fore legs they roll it into a little ball and carry it to the nest.

I have been excessively busy putting my garden in order before we set out. Indeed, I have become so wonderfully active, that you would scarcely know your little indolent girl ; and I am often inclined to sing the old nursery song to myself, ' Sure this is none of I ! ' Among other things, I have performed a grand operation in my hyacinth beds. Lady Binning, you know, is a great florist ; I heard her speak of the manner in which her gardener manages the hyacinths, for which her garden is remarkable ; and I determined to try it. As soon as the leaves become all yellow, he takes up the bulbs, removes the loose skins and offsets, and all the fibres that are decayed, and immediately replants them in a bed of fresh compost. Lady Binning told us, that, when treated in this manner, they equal the Dutch hyacinths in strength.

All this was duly executed yesterday. I had been watching the leaves for some time, as I wanted them to be quite yellow ; and I now flatter myself with having a very grand display next year.

I had also many cuttings to make, and seedlings to plant out, as well as layers of pinks and

carnations, and various plants to trim and tie up; besides the daily occupations of weeding, watering, pruning, and earthing.

9th.—I have just found the most curious miniature cocoons of yellow cotton, sticking on a chrysalis of the cabbage caterpillar. Some time ago, I put up two of these caterpillars in paper boxes; they were regularly fed, and made quite comfortable; and now, though one is a perfectly sound chrysalis, the other is only an empty skin. In the little book which I have so often mentioned, Mary showed me the cause of this in the dialogue between Lucy and her mother on *ichneumons*; it was from their eggs, which were deposited in the body of the caterpillar, that the maggots proceeded who destroyed it, and then spun those pretty little yellow cocoons. It is a great pleasure, Mamma, to have traced a curious fact of this kind for myself, and actually to have seen one chrysalis dwelling in another. These *ichneumons* must be very useful in thus destroying other mischievous insects. Reaumur found, that out of thirty common cabbage caterpillars, which he put into a glass to feed, twenty-five were killed by an *ichneumon*; and my aunt says, that if the myriads of caterpillars which prey on our vegetables are compared with the small number of butterflies that they usually produce, it will appear that they are

destroyed in a still larger proportion. This is one of the innumerable instances of the goodness of Providence, which balances the necessary evils of one tribe of animals by the instinctive efforts of another.

My aunt told me, that in St. Domingo the cassada and indigo plantations are materially injured by a large caterpillar. When it changes to its last robe of sea-green, its tortures begin ; a swarm of ichneumon flies fasten themselves all over the poor victim, drive their stings into the skin, and then deposit their eggs in the wounds they have made. The caterpillar swells and becomes of a deeper green ; and in a fortnight, when the eggs are hatched, it appears covered with little worms, which start out of every pore. The existence of these worms is but short ; after raising themselves on one end, shaking their heads, and swinging themselves in every direction, each of them begins to form its cocoon ; and in two hours the caterpillar is completely clothed in a white robe. In eight days the ichneumon flies are hatched, and the little cocoons they leave behind are composed of a very fine silky cotton, of the most dazzling whiteness, which may be used without any preparation, as soon as the flies have quitted them.

The quantity of this glossy substance, produced by the millions of those little parasites, is

so great, that it is said a single person has collected a bushel in two hours. But the chief importance of their services is the keeping within bounds the mischievous cassada caterpillars; and as these caterpillars are destroyed by heavy rain, it has even been proposed to collect and put them under cover, as soon as the ichneumon's eggs are deposited, in order to multiply these useful insects.

10th.—June is really a most lovely month here;—the trees are clothed in foliage of the freshest green, and flowers are scattered everywhere in profusion. Mowing is just beginning, and everybody looks busy, active, and cheerful.

I was very happy yesterday: we went to see the sheep-shearing at Farmer Moreland's; it seemed to be almost a festival, and was conducted with a degree of regularity and ceremony that was quite amusing. Caroline delights in these rural employments; and we were all allowed to go there early in the morning. We found the sheep inclosed in a fold under the shade of an ash-grove, and the shearers seated on the knotted roots of some of the old trees. Dame Moreland gave us some brown bread and new milk; and before the day grew very hot, we returned home. In the evening, however, having dined early, we returned to the pretty grove and the poor bleating sheep, whom I could

not help pitying when thrown down to be shorn ; though they looked a great deal more comfortable as soon as they were relieved from their thick, hot clothing.

I saw some of them washed a day or two before the shearing began ; their fleeces were well rubbed and rinsed in the stream, and then the poor creatures ran to a sunny bank,

Where, bleating loud, they shook their dripping locks.

My uncle told me that England has been always famous for its sheep and their rich fleeces, the various qualities of which are so well suited to the different branches of our woollen manufactures ; but it is the Downs of Dorsetshire, and all the southern and western counties, which supply those sheep whose fleeces are employed in making the finest broad cloth.

We stayed till the men ceased working, and till we had seen the shearers and all their assistants sitting down to a comfortable supper, with abundance of cider ; we then left them, and came home by a long winding path. We were quite in the dark for some of the last part of the walk, which gave me an opportunity of seeing the English glow-worm on the dry banks at the edge of the forest.

When evening closes Nature's eye,
The glow-worm lights her little spark,
To captivate her favourite fly,
And tempt the rover through the dark.

Conducted by a sweeter star
Than all that decks the skies above,
He fondly hastens from afar,
To soothe her solitude with love.

My uncle told me that Dr. Macartney, who has investigated the subject of luminous insects with great ability, has ascertained, that in the glow-worm, part of the light proceeds from a yellow substance lying underneath a transparent part of the skin. Besides this, he observed, in the last segment of the body, two minute oval sacks, formed of an elastic fibre, wound spirally, and containing a yellow substance also, but of a closer texture, and giving a more permanent light. This light seemed less under the control of the insect than the other, which it has the power of voluntarily extinguishing, and which ceases to shine when extracted from living glow-worms; but the two sacks, when taken out, continue to give light for some hours.

11th, Sunday.—‘ I think, father,’ said Mary, ‘ that in reflecting on the three dispensations, it appears that neither the Jews, nor the religious people of the patriarchal ages, had that clear and distinct knowledge of the doctrine of future rewards and punishments which we Christians possess, nor that full conviction of the immortality of the soul which now cheers mankind.’

‘ True,’ said my uncle, ‘ those awful truths had indeed been early opened to them, and they

were gradually unfolded with increasing clearness by the later prophets ; but at the best they were obscurely understood, or, in the language of St. Paul, they were seen as " through a glass, darkly." It was reserved for our Saviour to throw such a clear and steady light upon the doctrine of immortality, that " we might have a strong consolation, who have fled for refuge to lay hold upon the hope set before us : which hope we have as an anchor of the soul, both sure and stedfast *."'

' This beautiful simile,' continued my uncle, ' which compares hope to an anchor, was first used by St. Paul. The ancient poets described Hope as a nymph, decorated with smiles and flowers, and soothing the labours of man with the idea of distant pleasures ; but St. Paul represents hope as the stay and anchor of the soul ; and so striking is the figure, that it has been since adopted into every language. He does not allude to the vain wishes arising from a heated imagination, but to the stedfast hope which springs from faith : as the vessel is kept firm at her anchor, in defiance of storms and currents, so the Christian is " not moved away from the hope of the Gospel" by adversities and temptations.

' You are all acquainted with the ancient fable of Pandora's box ; at the bottom of which it is said that, as the only means of supporting the human race under the multiplied evils that

* Hebrews vi. 18, 19.

were about to issue from it, Jupiter placed the last and best blessing of Hope. It is not improbable that this fable was founded on a tradition of the original promise of the future seed; the hope of which could alone have sustained the virtuous part of mankind amidst the general corruption that followed the transgression of Adam.

‘ But an unsettled kind of hope will be of little avail; to be useful, it must be grounded on faith; on that entire faith which not only believes in the authenticity of our Saviour’s sacrifice, and in the importance of the doctrines he taught, but which fully and gratefully confides in the sufficiency of his atonement. Then hope indeed helps us to anticipate the glorious future; we view him as risen triumphantly to heaven; and we feel that we shall partake in the happiness of the hereafter which He has promised.

‘ That the hopes of a future state are natural to the mind, may be inferred from the craving and dissatisfied feeling which accompanies our very enjoyments, and which always more or less clouds them with fresh wishes and indefinite hopes. These hopes, it is true, in the worldly man, are set upon pleasures, business, or ambition; or on some of those bustling objects of life, which, from their vicinity to the human eye, assume a false magnitude. But the true Christian learns that heavenly objects, which from

their distance appear comparatively faint, swell upon the sight of those who earnestly study them ; while the others fade away, and elude the grasp. Religion assists him in correcting those illusions of vision ; faith helps him in assigning the proper direction to his hopes ; and he makes it his continual care to preserve the enlightened views ; which, through the Divine mercy, he has obtained. This awful truth has sunk deeply into his mind—"The things which are seen are temporal, but the things which are not seen are eternal ;" and a just impression of their relative value enables him to maintain a happy composure in all the vicissitudes of life.'

Before my uncle dismissed us, he said, ' This, my dear little friends, is the last quiet home Sunday that we shall have for some time. Before we return, many unforeseen changes may occur ; we are going, as it were, to launch into the world ; we may be separated ; and our regular habits must be unavoidably interrupted. But in every situation we can cultivate and strengthen in our hearts the Christian hope ; and though we may, perhaps, no longer give each other mutual aid, we can, at least, each of us watch over our own hearts. Let me then entreat your attention to a few practical hints.

' Never allow yourselves to consider religion as a painful restraint, but rather as the performance of a grateful duty. Whenever that duty has the

least appearance of being irksome, search and you will find that some incompatible but favourite pursuit entices away your thoughts: throw it then aside, however blameless it may otherwise be, or however innocent may be its pleasures. Remember with whom St. Paul classes those who are "lovers of pleasures more than lovers of God."

' Frequently examine the state of your moral and religious feelings, and when you perceive a deficiency in any point, beware of lowering the standard of virtue to meet your practice, instead of endeavouring to rise to the level of your duty.

' Watch vigilantly your *small* faults. You will find the unhesitating sacrifice of any one of them productive of the purest satisfaction, and each victory will make the next struggle more easy. But, in doing this, be careful to resist that most seductive propensity of all minds, the looking back with too much complacency at the faults we have conquered, or at the virtues we possess, instead of fixing our eyes on the sins we have yet to overcome, and the improvement we have yet to achieve.

' And, lastly, arm yourselves with a determined resolution not to rate human estimation beyond its true value. No one should affect a needless singularity; but to aim at things which in their nature are inconsistent, to seek to please both

God and the world, where their commands are really at variance, is the way neither to be respectable, nor good, nor happy.'

'Fernhurst, for the last time. in. dec.'

12th.—The corn-fields are coming into ear, the hay-harvest is going on, new flowers are springing up; and all the walks, and gardens, and shrubberies, are in the highest beauty, and yet we are going to leave this dear place! To-morrow we are to quit Fernhurst and all its happiness! But that is a silly feeling, for we all go together, and surely we may make ourselves happy anywhere, even in Ireland. A year ago I was just leaving my dear Mamma, and the happy home to which I had been so long accustomed to place myself among strangers;—and now I am going among still greater strangers—among the Irish. But my uncle says they are a warm-hearted, hospitable people, and that the country is so full of objects of interest, that I shall not have to regret the employments of Fernhurst, nor even my favourite gardening experiments.

I am happy to tell you, that most of these experiments have succeeded very well as yet: particularly one I have been trying on my dahlias, by budding them on the roots. They have already produced some very flourishing plants; and as the bearing buds were employed, they will blossom this year. I must make you ac-

quainted also with a little bower, which we have all assisted in making in a charming spot: it is canopied with woodbine, and lined with moss; and you might say of it—

Is this Titania's bower, where fairies play
Their antique revels in the glow-worm's light?
Moss and wild thyme are all the weeds which stray
To pave her palace with a green delight.

As we were taking our last walk late this evening, we saw the goat-sucker, which is nearly allied to the swallow in its form and habits, though generally larger in size. Frederick, who is my chief preceptor in everything relating to the feathered race, tells me that, except on very dark, gloomy days, these birds are seldom seen till twilight. That is the time the insects come out which form their principal food; and he says, it is probable that the extreme sensibility of eyes calculated for that period of the day could not bear the dazzling light of the sun. Their mode of perching is singular, as they place themselves lengthwise on a branch, and not in a cross direction, like most other birds. The mouth is uncommonly large, fringed with bristles, and moistened by a glutinous fluid, to which the smaller insects adhere; and you may therefore conceive the destructive powers of this bird, for it flies through their swarms with its voracious jaws wide open, darts in every direction at its larger prey, and swallows

all, without ever closing its bill. It is in this last circumstance that it chiefly differs from the martin, the swift, and the rest of the swallow tribes ; for they never open their bills, in flying, but to snap at their prey, and they shut them with a sharp peculiar noise, which every one must have observed.

There is no end to the variety of names which this bird has acquired in different parts of England—goat-sucker—goat-owl—fern-owl—churn-owl—wheel-bird—dor-hawk—night-jar, &c. In most of these names there is some allusion to its peculiar habits, its haunts, its motions, or its noises, except in the first, which is the commonest and the most absurd of all, as if a goat would allow itself to be sucked by a bird ! And yet, however ridiculous, my uncle showed Frederick, in Aristotle and Pliny, that the ancients gave it a similar name.

I understand that it is not a very common bird here ; but we saw it for a considerable time rapidly wheeling round and round a large oak tree, and hawking among the branches in pursuit of the fern-chafer, its favourite food. The hawking of this bird reminds me of an amusing passage in the Persian Sketches.

‘ At Shiraz, the Elchee (envoy) received a present of a royal falcon. Before going out, we had been amused at seeing our head falconer put upon this bird a pair of leathers, which he

fitted to its thighs with as much care as if he had been the tailor of a fashionable horseman. I inquired the reason of so unusual a proceeding. "You will learn that," said the consequential master of hawks, "when you see our sport."

'The first hare seized by the falcon was very strong, and the ground rough. While the bird kept the claws of one foot fastened in the back of its prey, the other was dragged along the ground till it had an opportunity to lay hold of a tuft of grass, by which it was enabled to stop the course of the hare, whose efforts to escape would have torn the hawk asunder, if it had not been provided with the leather defences which I have mentioned.

'The next time the falcon was flown gave us a proof of that extraordinary courage which its whole appearance, particularly the eye, denoted. It had stopped and quite disabled a hare by the first pounce, when two greyhounds, which had been slipped by mistake, came up, and endeavoured to seize its prize. They were, however, quickly repulsed by the falcon, and with a boldness that excited our admiration and astonishment.'

And now, dear Mamma, I must go and pack up my pretty writing-box which my uncle has given me ; it holds paper, and pens and ink, and pencils, my journal and account-book, and every-

thing one can want ; even a nice little red leather case for colours, which Caroline made for me ; and yet it is not above two inches deep. It is quite flat—but I can make a desk of the lid ; and as it is to lie in the bottom of the carriage, under our feet, I have put it in a green cloth cover. I was afraid it might be troublesome ; but my uncle and aunt know how to make every one comfortable without inconvenience to others.

This is my last line from dear, happy Fernhurst !

13th June, Worcester.

This morning, at seven o'clock, we set out on our journey. Everything had been arranged and packed the day before, so there were no delays in the morning ; all were punctual, and I assure you, Mamma, that I was ready, and my work-box and travelling-book in my hands, before my uncle gave the first summons for assembling. We have several books in the carriage, but no loose parcels ; and within-side it does not look as if it was prepared for a long journey.

Poor little Grace has been left with the Maudes, in whom my uncle and aunt have the most perfect confidence.

We have seen the fine old cathedral in this city, and the porcelain manufactory, both of which I had intended to describe to you ; but my

aunt recommends it to us to go to bed, as we are to be up very early to-morrow morning, in order that there may be full time for seeing the carpet manufactory at Kidderminster, on our way to Shrewsbury, where we are to sleep. So, good night, though it is scarcely yet dark. What charming long days there are in this country, compared with those of Rio !

14th June, Shrewsbury.

Sweet is the dubious bound
Of night and morn, when spray and plant are drench'd
In dew.

Everything was in that state when we set out early this morning from Worcester ; it reminded me of all my uncle had told me about dew, and I took the opportunity of asking him if dew is formed in the morning. ‘ It continues to form in shaded places, after sunrise,’ said he ; ‘ but there is a shorter interval between sunrise and its ceasing to form, than between its first appearance in the afternoon and sunset ; though Dr. Wells thinks, that if the weather be favourable, more dew forms a little before and a little after sunrise, in shaded places, than at any other time.’

My aunt remarked, that a few years ago, while in constant attendance on a sick child from July to September, she rose every morning at day-break ; and had an opportunity of observing,

that about an hour before sunrise the dew was particularly abundant. The window was frequently kept a little open at night, when the room was close, and the weather still; but the air became so chilly just as this heavy dew came on, that she was always obliged to shut it; yet during the night the chill was never perceived; which corroborates what Dr. Wells says, 'that the cold of the atmosphere is greater in the latter than the prior part of the night.'

In the course of Dr. Wells's observations, he found that dew does not form readily on gravel-walks; and that if the atmosphere be clear, neither the road nor pavement are moistened with dew, though the grass on the road-side, and painted doors and windows, are frequently wet. He found also, that wool, though highly attractive of dew, was prevented, if placed on a gravel-walk, from acquiring as much dew as an equal parcel of wool, if laid upon grass.

I asked why Dr. Wells used wool in these experiments, and my uncle told me, that at first he had only compared the quantities of dew on bodies having smooth surfaces; but that he found wool much better adapted to collect dew from the atmosphere, as it readily admits the moisture amongst its fibres, and retains what it receives very firmly. Filamentous and downy *substances* are by far the most productive of

cold, such as wool, cotton, and flax, and still more fine raw silk and swan-down; all these were more steadily cold upon clear nights than even the grass, but swan-down showed the greatest cold.

‘I have already explained to you,’ continued my uncle, ‘that the surface of the earth, and all substances upon it, radiate back into the sky at night the heat which they receive in the day; and that, when this radiation is unobstructed by clouds, the cold it produces is proportionably greater. But the degree of cold is very much augmented when the form or situation of these substances prevents their deriving fresh supplies of heat from warmer bodies in contact with them, or in their neighbourhood. Most of the substances which I have named are not only naturally bad conductors of heat, but their form scarcely permits them to transmit from fibre to fibre any heat they might acquire. This is the reason why dew appears in greater quantity on shavings of wood than on a thick piece of wood; and why filamentous substances become colder than all others.

‘On a dewy evening the Doctor depressed a small tumbler into the soft garden mould, so that the brim was level with the ground; and he placed another standing on the surface of the mould: in the morning the former was dry in the inside, while that which stood on the surface was

dewed ; and the thermometer being applied to each, the heat of the depressed one was found to be 56° , while the other was only 49° ; for not only had the upper glass more readily parted with its heat by radiation, but the other had received a constant supply of heat from the surrounding earth. In the same manner it may be explained, why the prominent parts of bodies are often encrusted with hoar frost, while the more solid and retired parts are free from it.'

I then inquired, why there is less dew on a windy evening ; for one would suppose that wind, instead of preventing the radiation of heat, would rather help to promote it.

He replied, 'All bodies exposed in a clear night must undoubtedly radiate as much of their heat during a storm as in the most perfect calm ; but whenever radiation is going on, the air is more or less warmed by it ; and consequently wind, which is only air in motion, serves to bring a continual stream of its warm particles into contact with those bodies. This restores almost as much heat as they had lost, and prevents the deposition of dew ; for, you know, dew is nothing but the moisture of the atmosphere condensed by meeting with colder substances ; and, therefore, whatever tends to equalize the temperature of the air, and of those substances, must obstruct the formation of dew.'

We breakfasted at Kidderminster, and saw

every part of the carpet manufactory ; but the chief interest of the day has been a magnificent *inclined plane* on the Shropshire canal, which my uncle was so good as to go out of the direct road to show us. It is a slope of 350 yards in length, with a fall of 70 yards, connecting the canal on the high ground with the canal on the lower level ; and the boats, being placed in a kind of cradle upon wheels, are allowed to roll gently down the inclined plane, or are drawn up by the power of a small steam-engine. By this contrivance three great savings are effected, he said. First, the prodigious expense of building twenty-one *locks*, which would be required for that height ; secondly, the time occupied in passing through all those locks ; and thirdly, the quantity of water which is wasted every time a lock is opened, and which, in some parts of the country, it is very difficult to replace in a dry summer.

Wood Lodge.

16th.—So far our journey has been most agreeable in every way. My uncle and aunt not only stop wherever there is anything to see, but they tell me what to observe, because they know that, through ignorance, I might overlook the things which deserve the most attention. Only think, Mamma, of their having actually come into Cheshire, in order to show me a salt-mine.

My uncle promised it many months ago, and he never forgets a promise to any of us, even about a trifle. Some old friends of theirs, Mr. and Mrs. L., live at this pretty place, where we arrived yesterday evening. We were received with warm affection; and I was considered as one of my aunt's children, and treated with equal kindness.

As soon as an early breakfast was over, we all drove or rode to Northwich, about five miles from this; and between the fineness of the day, the good nature of both new and old friends, and the complete novelty of going down into a mine, it has been a delightful expedition indeed.

By my uncle's directions, I put on an old dress of one of the miner's wives, over my own, to prevent it from being soiled by the iron chain and the bucket in which we were let down. By the time I was near the bottom, I began to hear the confused sound of the people below, and to see the indistinct flickering of candles; and on looking up, the day-light admitted from above by the opening through which we had descended looked smaller than the moon. The walls, and pillars left occasionally to support the roof of the mine, quite disappointed my imagination; for they are of a dirty brown colour, instead of the brilliant white I had expected. In a few places, indeed, they sparkled a little in the gleams of the candles which we carried.

After walking about in various directions, and feeling as if in the crypt of some large church, we came to where the men were working. They were just going to light the train to blast off a rock of salt ; and I assure you it was very near the place where we stood ; but we were secured behind a projecting point. The roof, there, was not above twenty feet high, and the sound was very grand, continuing to reverberate at intervals for a minute and a half.

The salt lies in strata, from between which water is always trickling ; and the white salt used for eating is made from this water, which is pumped up above ground either by steam or horse-power. It is then put into what are called preparing-pans, where it is brought to the degree of heat requisite for separating the earthy impurities. These subside to the bottom, and leave the brine clear, and ready to be afterwards evaporated in the salting-pans, which are shallow, and I am sure twenty or thirty feet long.

Some years ago, the excise-duty was twenty-five times the actual value of the salt ; but that is now taken off, and, therefore, great additional quantities are raised for agricultural or other purposes. I hope this will benefit the workmen, who seem to be very poor, for their cottages are very wretched : each of them, however, is surrounded by a nice little garden ; and my aunt

made me observe, that the thrift, or sea-pink, flourishes there, as well as where it grows naturally in the salt atmosphere near the sea-shore.

I can write no more now. We continue here to-morrow, I believe ; and the next day we shall go on to Llangollen.

Penrhyn Arms, Bangor.

20th.—Our whole journey through Wales has enchanted me ;—the mountains, rocky streams, and woody banks, have more than realized all I had heard and read of its wild and impressive scenery.

My uncle took us to see the celebrated aqueduct of Pontcysyllte, near Llangollen, which conducts the Ellesmere canal across the valley of the river Dee, at a great height from the bottom, and therefore saves the immense expense and loss of time that would have been occasioned by a series of *locks* on each side of the valley. It is one thousand feet long, and supported on twenty stone piers, which rise to one hundred and thirty feet above the bed of the river ; and he showed us that the water-course, which, in general, is built of stone and made tight with clay, is, in this aqueduct, composed of plates of cast-iron, that rest on great iron ribs ; the sides and bottom being screwed together, and the *joinings* filled with cement.

Having arrived in good time at Llangollen, we all went out to walk, and, by some accident, my uncle entered into conversation with a very intelligent Scotchman, who was erecting some power-looms. Machinery was, of course, the subject, and I think you will be amused by his description of an improved method of singeing off the small fibres of patent lace, so as to give it the proper *wiry* appearance. He was so good as first to explain to us the common mode of destroying the rough nap upon calico.

There is a smooth iron cylinder set horizontally over a furnace, the heat of which can be nicely regulated. A reel is so placed on each side of it, that the cloth which is rolled round the one, when wound off on the other, is lightly drawn over the cylinder, and comes in contact with its red-hot surface, with just sufficient velocity to allow the loose woolly filaments to be burned without injuring the cloth. The finest muslins are made to go through this operation, and with such precision as to be very seldom damaged. But in lace it is not enough to remove the projecting fibres; all those that are inside the texture must also be destroyed, as the beauty of the lace is greatly increased by the hard crisp look of the main thread; and to effect this, the lace is usually drawn over a line of gas-flame, so as to pass a current of heat through the open

spaces. It has been found, however, that even the combustible net-work of lace stops the ascent of the flame, in the same manner that the wire-gauze, in Sir Humphry Davy's beautiful lamp, prevents it from communicating with the inflammable gas in a mine. In the new method, to overcome this difficulty, a horizontal tube is placed a little above the lace, with a narrow slit just over the line or sheet of flame; and an air-pump being applied to the tube and rapidly worked, a strong draught is produced into the slit to replace the exhausted air. This draught draws up the flame along with it, in spite of the intervening meshes of the lace, and thus singes away the useless fibres within, as well as without.

In the course of our journey from Llangollen to this place, my uncle frequently made us observe the judgment with which the new road has been laid out by Mr. Telford, the same engineer who constructed the Llangollen aqueduct. In such a mountainous country it was impossible to avoid all hills; but by gradually winding up their sides, or by cutting the road out of the face of almost perpendicular cliffs, he has preserved one uniform and easy slope to the top of the highest ground over which it passes; and yet, at the same time, he has shortened it by several miles. And besides all this, he has shown so much taste, in the line he adopted, that, my

aunt says, one would think his only object had been to display the romantic scenery of North Wales to the best advantage.

We often got out of the carriage, and strolled about to look at the pretty water-falls and rocky passes; and we stopped for some time at the iron-bridge of Bettws. It is a single arch, of more than one hundred feet span. The iron-work that supports the road-way consists of the emblems of the three kingdoms and Wales—the rose, thistle, shamrock, and leek; and along the lower rib of the whole arch there is the following inscription, in open iron letters, each of which is about two feet high:—

‘ This bridge was constructed the same year the battle of Waterloo was fought.’

All this road was new to my aunt; she admired some of the views exceedingly, and was, I think, particularly struck by a very wild spot where Ogwen Lake is pent up by a circle of dark, rugged, misty hills. In approaching this town we were amused by the various uses to which slate is applied—palings, stiles, gate-posts, tables, benches, troughs, milk-bowls, and many others; and as the famous Penrhyn slate quarries are within a few miles, my uncle proposes to remain here to-morrow, in order to visit them.

Penrhyn Arms, Bangor.

21st.—Well, Mamma, we have been to those

famous quarries, and they are indeed wonderful. But to me the most striking thing about them is, that such prodigious excavations should have been made in so short a period; for we were attended by an old man who actually remembers the first opening of the large quarry. It also seemed astonishing that they should have been the work of men who appeared so diminutive, when compared with the huge blocks of slate round which I saw them clustering and bustling like a colony of little ants round a straw.

Everything is done here by a kind of task-work. A piece of the rock is bought by a party of men, who agree to work together; they convert it into as great a number of slates as they can, and the overseer purchases them at stated prices. Their first operation is to blast off a large block: this is done by making a round hole about two or three feet deep, with a pointed iron crow; a pound of gunpowder is then poured in, and the hole is rammed full of clay or broken slate. A thick wire, which was kept in the hole while the ramming was going on, is now withdrawn, and a straw filled with fine powder is introduced into its place, with a bit of match-paper fixed to the upper end. All is now ready—a man calls out with a loud voice that he is going to fire—the workmen scamper away, and hide themselves in the hollows of the rock—and he then lights the *slow-match*, and escapes as fast as he can. I

saw several of these explosions, or 'shots,' as they call them, each of them cracking the rock to a great distance, and carrying up in the air a frightful shower of fragments, which, my uncle says, reminded him of the stones he saw thrown out of Mount Vesuvius, in one of the great eruptions. The masses that were cracked by the explosion are now detached with levers and wedges, and broken into pieces of a proper size, which are then split into slates, while the blasters are preparing fresh materials; so that no one is idle for a moment.

The names given to the different sizes of slates will amuse you; they are taken from all ranks of our sex; queens, duchesses, countesses, and ladies; and each size has its peculiar thickness. I was very much interested by the quickness and expertness with which the splitters did their part of the business: the workman gently drives a chisel, or thin wedge, with his mallet, into the edge of the block—you see the crack running slowly along—and then, by a certain motion of the chisel, he separates the whole surface as neatly as a carpenter splits a piece of straight deal into laths. I was surprised at seeing some of these thin leaves of slate bending considerably while the splitter was forcing them off; but my uncle says, that all stones have more or less elasticity, and that a small marble ball will rebound to a considerable height, if dropped on a

hard substance. Some kinds of stone have a disposition to warp or bend permanently, as he made me recollect was the case in one of the slabs of marble in the dining-room fire-place at Fernhurst; and, he says, that the flags in many of the streets of London, are hollow on the upper surface, from their having been originally too thin, and from being supported only at the edges, they have yielded in the middle.

After the slates are split, they are squared and cut to the various shapes and sizes used in roofing; this is generally done in a rough but expeditious manner, with a sort of chopper, but some of the larger and finer kinds are cut with frame-saws, so as to be precisely of the same dimensions, and to have nice smooth edges. These are called *milled* slates, because the saws are worked by a water-mill. Of course, we went to see this operation: a fine mountain-stream turns the wheel which gives motion to more than a dozen pair of long frame-saws; each pair is set to the distance required for the length or the breadth of the slate, so that the parallel sides are cut by the same stroke; and, as the saws move forward and backward, water is kept constantly dripping into the cut, and sand is thrown in by boys. The saws, we were told, would make but slow progress without the assistance of sand—the sharp grains of which *are carried forward* by the jagged teeth of the

saw, and are thus made to tear away the slate.

‘ It is on this principle,’ said my uncle, ‘ that precious stones are cut by a thin circular plate of iron, with emery or diamond powder. And a seal engraver’s apparatus is only a sort of lathe, to which he can attach small copper-wheels that are made to revolve with great rapidity. To the plain edge of one of these wheels he applies oil, with a little diamond-powder, which soon cuts into the hardest stone ; and thus by the form and size of the wheel, and the direction in which the stone is pressed against it, he can accomplish any device, either in relief or intaglio. In all these cases, the particles of sand, emery, or diamond, bed themselves in the soft metal, and grind away the harder surface opposed to them ; and, what will appear rather singular at first sight, when two hard substances rub against each other, it is the hardest which wears away the most. For instance, the highly tempered steel *knife-edges*, by which some pendulums are suspended, for experimental purposes, are less liable to wear than the still harder agate planes on which they work : for the minute atoms of dust conveyed by the air adhere to the steel, and in the course of time act upon the agate.’

But to return to our mill. Solid blocks, thick enough to make about twenty slates, are thus sawed first, and afterwards split in the usual

manner. Here, also, we saw an immense number of little writing slates; they are made from the finest-grained part of the quarry; and their smooth surface is produced by an operation very like that of planing a board.

The great blocks are carried from the quarry to the mill, and the slates, when dressed and finished, are also conveyed to the sea-side, by little waggons on *iron railways*. It is wonderful what a load a horse will draw in this manner, when compared with the utmost work he can do on the best common road; and yet a railway appears to be a very simple contrivance. Two parallel lines of flat iron bars are laid along the road; the horse walks between them, and thus the wheels of the waggon, in rolling along the bars, neither meet with the stones and obstacles which would impede their motion on a road, nor do they sink into its hollows and soft places. The bars are scarcely broader than the rim of the wheels, which would, therefore, slip off, but for a little raised ledge, or, as it is called, a *flange*, along one edge of each bar. When railways are intended to carry heavy weights, both going and coming, they must be laid perfectly level; but at these quarries, as all the weight goes *down* to the port for embarkation, the same horse that draws several loaded waggons hooked together down hill, can return up hill with an equal number of empty ones.

From the mill we drove to the port of Penrhyn, which is just behind this house, and where all the slates are shipped. A prettier spot cannot be seen—the sea to the northward—the Strait of Menai—the blue hills of Wales—the town of Beaumaris, on the opposite coast of Anglesea—and the quay or pier embosomed by the surrounding high banks, with a few patches of trees on their summits. The whole harbour was full of vessels waiting their turn for loading, and the busy appearance of waggons, horses, and drivers, ships, boats, and sailors, all in motion, presented a most interesting scene.

Before I go to bed, I must add a curious coincidence that occurred this evening. My uncle had brought with him, as his travelling book, the Life of the Lord Keeper Guilford; and, after he had been explaining to me the history and the importance of rail-roads, he opened his book, and I sat down to my journal. But he had scarcely begun to read, when he came to a passage describing a road, nicely levelled, and laid with long boards—to all intents a *railway*; and this was used for conveying coals from one of the pits at Newcastle, so long ago as the year 1670. Yet it was not, my uncle remarked, till 1767, that *iron* railways were invented. Mr. W. Reynolds of Coalbrook-dale first adopted them; and his example was quickly followed in all parts of Great Britain, and indeed all over the world.

One word more, dear Mamma, and then I will go to bed ; but my uncle has just read to us such an interesting passage from that same Lord Keeper's life, that I really must tell it to you. The children of the family at Badminton were bred with philosophical care ; no inferior servants were permitted to talk to them for fear of their imbibing some mean sentiments ; and he mentions the following anecdote as a proof of their high principles. Lord Arthur, who was then little more than five years old, reproached the Chief Justice Hales with his cruelty in condemning men to be hanged. The judge told him, that if they were not hanged, they would continue to kill and steal. ' No,' replied the boy, ' you should make them promise upon their honour that they would not.'

What a fine sense of honour that child had !

June 22nd.—

Mona Inn.

Mona on Snowdon calls !
 Hear, 'thou king of mountains, hear ;
 Hark, she speaks from all her strings ;
 Hark, her loudest echo rings ;
 King of mountains, bend thine ear :
 Send thy spirits, send them soon,
 Now, when midnight and the moon
 Meet upon thy front of snow :
 See their gold and ebon rod,
 Where the sober sisters nod,
 And greet in whispers sage and slow.
 Snowdon mark ! 'tis magic's hour ;
 Now the mutter'd spell hath power—

Power to rend thy ribs of rock,
And burst thy base with thunder's shock ;
But to thee no ruder spell
Shall Mona use, than those that dwell
In music's secret cells, and lie
Steep'd in the stream of harmony.

Caroline repeated these lines after we had ascended the new road from the Menai bridge, and were losing sight of the extensive view of Plas Newydd, the winding straits, and Snowdon proudly towering over the Caernarvon mountains.

‘ Well chosen lines,’ said my aunt ; ‘ Mason’s Caractacus is always interesting, but particularly so in this once sacred island, where

———— with more than mortal fire
Mighty Mador smote the lyre.’

‘ Mason gives such a nice touch of mystery to these lines,’ said Caroline, ‘ that I almost feel the magic spell, and expect to see the mountains whiten with the slow-descending Druids.’

‘ I wish, uncle, that you would tell me something about the Druids ; I am very fond of the history of those early times.’

‘ That, probably, arises from your love of fairy tales and fables, Bertha ; for there is much fable, I believe, in all early history : but be that as it may, we may amuse ourselves with Druidical fable while we drive along this bare country :—now for your questions.’

‘ In the first place, then, uncle, what were those mysterious Druids ? ’

‘ The Druids were the priests or ministers of the religion of the ancient Britons. Their worship was devoted chiefly to the Sun ; but they had, it is thought, several inferior deities. They offered human victims in sacrifice, and practised many extraordinary rites ; the caverns and gloomy groves of oak in which they dwelt, and the dread which hung over their mysterious worship, gave them a terrific influence over the minds of the people. Music aided superstition in preserving this influence ; for they were attended by bards, whose effusions, supposed to be inspired, either raised or lulled the passions as they chose. This is expressed in the address of the chorus in *Caractacus* to Mador the chief of bards :—

Mador thou
Alone shalt lift thy voice ; no choral peal
Shall drown thy solemn warblings ; thou best know’st
That opiate charm which lulls corporeal sense :
Thou hast the key, great Bard ! that best can ope
The portal of the soul ; unlock it straight,
And lead the pensive pilgrim on her way
Through the vast regions of futurity.

‘ The Druids alone had the privilege of wearing white clothes ; their persons were inviolable ; and they were exempted from all service and taxes. What little knowledge there was in those times was entirely confined to them ; so that,

besides their priestly duties, the practice of medicine and the administration of justice were in their hands; and those who resisted their decrees were placed under a dreadful ban, or interdict, during which no one dared to speak or look at the culprit. Thus possessing all the real power of the state, and venerated as the immediate interpreters of the gods, the children of the highest families were eagerly made over to them; and even princes were ambitious to belong to their fraternity. This unbounded influence and their great riches naturally exciting the jealousy of the Romans, in the reigns of Claudius and of Nero, they were nearly destroyed; and the oak woods of Anglesea, or, as it was then called, Mona, the residence of the chief Druid, were burned. There are still many remains of their temples in this island, and it is said that some of their caves have been traced,

where underneath

The soil we tread, a hundred secret paths,
Scoop'd through the living rock in winding maze,
Lead to as many caverns dark and deep.

‘ You spoke of their riches, papa,’ said Mary; ‘ but by what means could those inhabitants of rocks and woods have acquired any?’

‘ I think we may conclude that those who possessed such an unlimited ascendancy over the people must have known how to enrich themselves; and you may also recollect, that as their

principal establishments were in our best mining districts, it is probable that they supplied the country with all the tin, copper, and lead that were used. It has been further suggested that they availed themselves of the famous Parys copper mine in this island, not only for its valuable produce, but for the purpose of imposing on the credulity and superstition of their followers; for the apparent conversion of bits of iron into copper, when steeped in the strongly saturated water of the mine, as well as the blood-coloured streams which were thus produced, could have been easily represented as resulting from the supernatural power of those crafty impostors.'

— 'You said, uncle, that the worship of the Druids was chiefly directed to the Sun; from which I suppose they were the fire-worshippers you mentioned on May-day, who came here from the East.'

In reply, my uncle told me, that 'there certainly were some points of resemblance between the Persian Magi and the Druids of Britain. They were each forbidden to worship the deity within covered buildings; and all acts of devotion were confined to open temples or consecrated forests. Like the Persians, they beheld the Creator in the works of nature; and gigantic trees and massive rocks were the symbols of *Almighty* power which they most admired.

‘The Druids and the Baal worshippers of Asia formed sacred heaps of stones on the tops of the hills. Many of these are to be found in Cornwall, Wales, Scotland, and Ireland—and the name which they bear, of *Cairn*, is derived from a Hebrew word descriptive of buildings like the pyramids of Egypt, or the cone-shaped pagodas of India, which are supposed to have been emblematical of the rays of the sun.’

I reminded my uncle of the singular temple which cousin Hertford saw in the Isle of Lewis.

‘Yes,’ he said, ‘it is evidently the remains of a great Druidical work; and Maurice, in his “Indian Antiquities,” observes that Stonehenge, a model of which I once showed you, Bertha, plainly alludes, in situation, number of stones, and other circumstances, to the Asiatic Astronomy, and resembles in every respect the ancient style of temple used by the Persians before the time of Zoroaster. It was he who first covered in the Persian temples to preserve the sacred fire; and, therefore, the arrival of the colony here, who introduced the fire-worshippers, must have been in a very early age. But,’ he continued, ‘I must not lead you into this maze of antiquarian difficulty; it has been a very interesting object of research to a few learned people, though it can only perplex the half-informed.’

‘But tell me, uncle, is this idea of an eastern colony a very new one?’

‘Oh no,’ said he, ‘it has long existed in tradition, and is alluded to in one of the Druid’s odes in Caractacus.

Hail, thou harp of Phrygian frame!
In years of yore that Cambria bore
From Troy’s sepulchral flame;
With ancient Brute, to Britain’s shore,
The mighty minstrel came.’

I asked then if there were any traces of the Eastern languages amongst us, besides the few detached words he had once mentioned to me; though I thought there was but little chance that any could have been preserved in a country where so many nations had successively settled.

‘Yes,’ said he, ‘a celebrated antiquary has proved that there is really a strong resemblance between the Irish language and the Hebrew, which is considered the original, or first of all languages. In the Welsh, also, or British, which is of the same nature as the Irish, many words appear to be of Eastern origin; and a gentleman of Bristol, having lately collected the common old British names of the indigenous plants, has found several of them to be in sound and sense pure Hebrew.’

‘Pray, uncle, what is the meaning of the word Druid—would not that throw some light on the subject?’

‘It is impossible,’ he said, ‘now to determine *its* original meaning; and, indeed, the deriva-

tions of that kind of words are in general only fanciful guesses. By some, Druid has been derived from a Greek word *drus*, signifying oak ; and by others from an old British word *dree*, which has the same meaning. It has also been supposed to come from a Saxon word *dryth*, which means magician ; and, according to others, from a Celtic word *druis*, a doctor or learned man. There is a curious circumstance which seems to corroborate its derivation from oak,—namely, that in every country where the worship of the sun has prevailed, the oak has been venerated. It is also singular that the two names by which that tree is still known in Persia and India, had the same meaning in the ancient British and in Irish, *gaur* and *bahk*.’

The conversation was interrupted by our arrival at this inn, where my uncle has determined on passing the night, as we were occupied a much longer time than he had expected, in examining the magnificent chain bridge, lately suspended across the straits of Menai. I have made a little sketch of it for you, dear Mamma, which shall be accompanied by as good a description as I can give ; but in the mean time I must tell you, that this ‘ wonderful piece of work,’ as my uncle calls it, is almost two hundred yards long from pier to pier, and so high above the water, that large vessels pass under it with all their sails set.

Holyhead.

23rd.—Here we arrived this day at eleven; early to-morrow we are to sail, and in six hours we shall probably arrive in Ireland. What our immediate operations are to be in Dublin I do not yet know; but my journal shall be regularly kept for your satisfaction, my dear Mamma, though probably not so much at length as at quiet, peaceful Fernhurst.

On the road from Mona, this morning, we were talking over our travels; and as we all agreed that they had been delightful, my aunt asked each of us what was the peculiar circumstance that had made this journey appear so very agreeable. One suggested that it was the uninterrupted fine weather; another, the gaiety and good humour of the whole party; a third said it was the kindness and indulgence of my uncle and aunt; but Wentworth was decidedly of opinion that it was because 'we had not pushed on in a desperate hurry.'

My aunt agreed that all those circumstances had concurred in promoting the general cheerfulness; but she thought that some others might be also mentioned. For instance, there had been no indecision in our plans; the whole route, and the objects to be seen, had been previously discussed; the wishes of all had been consulted; and with that happy mixture of candour and of consideration for others, which constitutes good

breeding, they had been expressed, adopted, or waived, as appeared most suitable to the general taste. The punctuality of every body had been another source of satisfaction; as well as the mutual pains to share with each other every little discovery; and she placed above all, the disposition to be pleased. 'Even here,' she added, 'where to most people the *ennui* of such a place as Holyhead is only varied by dwelling on the expected miseries of a voyage, the same happy habits will produce the same results; out of doors you will, I am sure, find sufficient objects of interest, and within, we can double the pleasure of our journey by recalling the principal occurrences; Bertha, indeed, will have the additional resource of her journal, the scribbling of which has been her daily, and, I fear, ~~her~~ nightly occupation for the past twelvemonth.'

We soon after walked to the beautiful new pier and light-house, which have both rendered the harbour so much more safe and convenient than it was formerly; and then my uncle, Wentworth, and Frederick, proposed going to the Stack light-house, on the other side of Holyhead Island. Caroline and I begged very hard to be allowed to accompany them, and at last my uncle consented, though he thought the walk would be too fatiguing for us.

We scrambled up the high bare mountain, which rises behind the town; and certainly no

place ever looked more bleak and comfortless. At last the path unexpectedly led us to an abrupt precipice, at the bottom of which the sea beat in among the rocks with terrible violence. Indeed I could scarcely bring myself to look down. We found here a flight of steps, four hundred, I believe, which are cut in the rock, and which wind along its face to a sort of platform. We descended very carefully, keeping, as you may suppose, close to the rock, for the wind was rather high, the steps narrow, and we were often startled by the flocks of sea-birds that suddenly bounced up from the cliffs.

From this platform a sort of bridge of ropes extends to the Stack-rock, on which the light-house stands ; the bridge is a hundred feet long ; ~~the~~ sides are of net-work, and a few boards are loosely laid to walk on. It all moves so much, that I could not help feeling a little afraid ; and once the wind having blown my light gown into the openings of the net-work, I fancied that the guide, who was walking close behind, was pulling me back ; I stopped, and he scolded me for stopping ; but my uncle fortunately heard us, and smiling at my nonsense, he explained the cause of my alarm.

The poor light-house men are looking forward with great satisfaction to a new chain bridge which is preparing for this place. It will not *only be more safe and convenient for them in*

stormy weather and dark nights, but, by inducing more travellers to visit them, it will help to cheer their loneliness; and as there is a something in such very wild and dreary scenes, that touches a stranger's sympathy, they will no doubt frequently obtain little presents, which will enable them to indulge in a few more comforts than they can now afford. In truth this light-house must be a melancholy abode; the wind always howling above, and the sea continually roaring below, and sometimes even throwing its spray over the windows. It was, however, very nice and clean, and as comfortable as such a place can be: my uncle took us up into what is called the lantern, and explained the use of the concave metallic reflectors which are placed behind the lamps for the purpose of increasing the brilliancy of their light by reflection. He also shewed us the contrivance by which the light is made to disappear every two minutes, in order that sailors should be able to distinguish it from all other light-houses in the Irish Channel.

In returning, we observed that the tide had ebbed in the harbour, which had been so full when we first arrived, that the water came up almost to the door of the inn. It was now nearly empty; great mud banks extending from each side, and leaving only a little winding stream in the middle. This led to some questions about the cause of the tides, and my uncle promised

that to-morrow, when we are quietly seated on the deck—as neither of us intends to be sea-sick—he will endeavour to make me comprehend the manner in which the moon acts upon the ocean, so as to raise the waters in one part of the globe while they are depressed in another.

He then joined in a conversation that had been going on between Wentworth and Caroline, about the bottom of the sea. He said they were both greatly mistaken, if they supposed it to be everywhere a flat, even surface; on the contrary, like all other parts of the crust which surrounds the globe, it consists of sloping hills and plains, rocks and mountains. When these approach nearly to the surface of the water, they are called shoals and banks; and when their summits rise ~~above~~ it, they become islands. The different strata that compose the coast, may be often traced to some island at a considerable distance; the shores of France and England exactly correspond in some places; and to show the continuity of the strata, he says it is well known that many springs of fresh water, which must proceed from the land, rise through the sea from its bottom. He gave several instances of this, but I recollect only Bridlington Bay, in Yorkshire; and the Gulf of Naples, where there is a spring of hot water, that bubbles as it comes to the surface. Bituminous and mineral waters are also *found rising* through the sea; and near Cumana,

in South America, there is a spring of *naphtha*, which spreads itself on the waves, and frequently inflames.

When we reached the inn, we found that my aunt and Mary had bought some beautiful specimens of the green stone of Anglesea: it is called *Mona marble*, and is veined something like the verd-antique; but my uncle says it is not marble, but a species of *serpentine*; and that, like the green serpentine of Ireland, there is so much *mica* in it, that large pieces will not take an even polish.

I had intended to have given you some description of the great causeway which has been made to connect the little island of Holyhead with the great island of Anglesea; but my uncle is waiting to enclose this to London, and my aunt is almost out of patience at my not going to bed, as we are to embark very early in the morning.

I must, therefore, abruptly conclude—though this is my last English letter. Oh! when shall I again embrace you and dear Marianne!

Your ever affectionate

BERTHA MONTAGUE.

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THE END.







